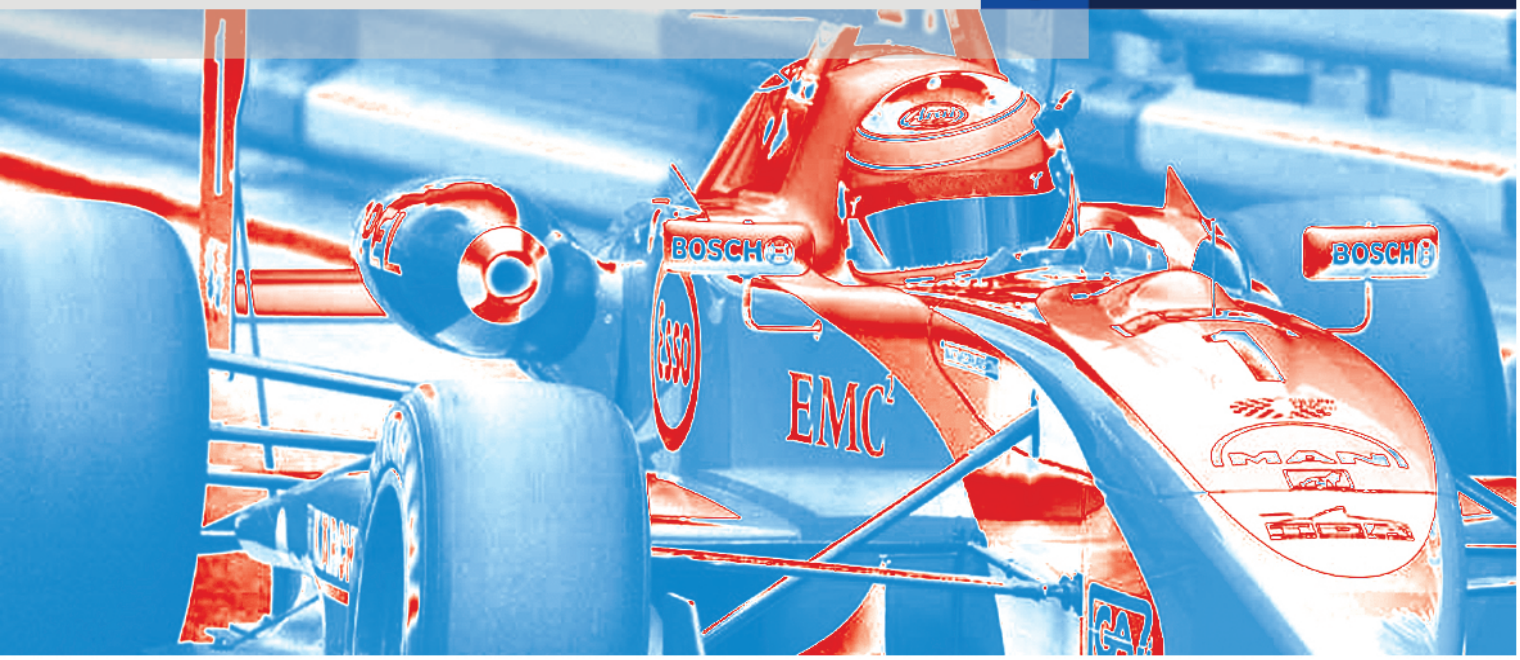
Edition 2004-2 | HPI | ECUs | Sensors | Displays | Actuators | Communication

Equipment for High Performance Vehicles

Motorsport



BOSCH

Contents

High Pressure Injection components

High Pressure Injection components

High pressure injection valve

High pressure fuel pump

Pressure sensor

High pressure amplifier (HPI-Box)

Pressure control valve

Component	Specification	Order number
HP amplifier HPI 2.1	Amplifier for engines with 8 cylinders	**B XXX XXX XXX**
HP injection valve HDEV 1.2	6-hole injector, 30 ccm/sec	**B 261 206 104**
HP fuel pump HDP 1	Pump with radial shaft seal	**B 438 172 061_01**
Pressure control valve DSV	AS-connector	**B 261 209 568**
Pressure sensor PSM	Pressure range: 250 bar	**B 261 209 332**

Engine Control Units

Motronic MS 2.8

The MS 2.8 is a highly sophisticated engine management system. The system layout is basically made for 6-cylinder engines. All internal power stages are designed with a diagnosis interface. Various engine and chassis parameters can be measured and logged. Four vibration sensor inputs allow knock detection and knock control. Injection time, injection end timing and ignition timing are calculated from basic maps and can be corrected by different engine parameters.

Functionality
Injection timing
Ignition timing
Lambda control
Boost control (option)
Knock control
Data acquisition

Mechanical data	
Dust and water proof aluminium housing	
Connectors in military technology	
Each pin individually filtered	
Vibration damped circuit boards	
Flexible housing fixation points	
Size with connectors	194 x 245 x 51 mm
Weight	2068 g

Conditions for use	
ECU temperature	-40 … 75°C
Max. power consumption	18 W at 14 V
Max. vibration	50 g sinus at 20 Hz … 2 kHz for t < 5 h

Electronic data
In general
7 microcontrollers with 16 bit organisation; calculator capacity 50 MIPS
Real time clock

Inputs
4 inputs for Ni-Cr-Ni exhaust gas temperature sensors
4 lambda LSM 11 interfaces
4 inputs for inductive wheel speed sensors (Hall optional)
42 universal inputs 0 ... 5 V
6 differential inputs ± 5 V
1 input for inductive or Hall crankshaft sensor
1 input for inductive or Hall camshaft sensor
4 inputs for knock sensors
Outputs
All power stages short circuit protected
6 high speed power stages (2A) for servo motor control
7 diagnosis signal outputs
12 peak and hold injection power stages with diagnosis interface
3 high current power stages (12 A) with diagnosis interface
6 ignition power stages with diagnosis interface
3 sensor supply 5 V/100 mA
3 sensor supply 10 V/200 mA
Communication interfaces
2 RS232 interfaces for telemetry and laptrigger
1 2-Mbaud interface for memory data read out or high speed telemetry
3 CAN interfaces
Memory
4 MB memory for data acquisition, storage time > 1 year

Motronic MS 2.8.2

The MS 2.8.2 is a highly sophisticated engine management system. The system layout is basically made for 6-cylinder engines. All internal power stages are designed with a diagnosis interface. Various engine and chassis parameters can be measured and logged. Four vibration sensor inputs allow knock detection and knock control. Injection time, injection end timing and ignition timing are calculated from basic maps and can be corrected by different engine parameters.

Functionality
Injection timing
Ignition timing
Lambda control
Boost control (option)
Knock control
Data acquisition

Mechanical data	
Dust and waterproof aluminium housing	
Connectors in military technology	
Each pin individually filtered	
Vibration damped circuit boards	
Flexible housing fixation points	
Size	194 x 245 x 71 mm
Weight	2200 g

Conditions for use	
ECU temperature	-40 … 75°C
Max. power consumption	18 W at 14 V
Max. vibration	50 g sinus at 20 Hz … 2 kHz for t < 5 h

Electronic data
In general
8 microcontrollers with 16 bit organisation, calculator capacity 60 MIPS
Real time clock
Inputs
4 inputs for Ni-Cr-Ni exhaust gas temperature sensors
4 lambda LSM 11 interfaces
4 inputs for wheel speed sensors
42 universal inputs 0 ... 5 V
6 differential inputs ± 5 V
1 input for inductive or Hall crankshaft sensor
1 input for inductive or Hall camshaft sensor
4 inputs for knock sensors
Outputs
All power stages short circuit protected
6 high speed power stages (2A) for servo motor control
7 diagnosis signal outputs
12 peak and hold injection power stages with diagnosis interface
3 high current power stages (12 A) with diagnosis interface
6 ignition power stages with diagnosis interface
3 sensors supply 5 V/100 mA
3 sensors supply 10 V/200 mA
Communication interfaces
2 RS232 interfaces for telemetry and laptrigger
1 2-Mbaud interface for memory data read out or high speed telemetry
3 CAN interfaces
Memory
4 MB memory for data acquisition, storage time > 1 year

Motronic MS 2.9

The MS 2.9 engine management system contains 12 ignition power stages and 24 independent injection power stages. All internal power stages are designed with a diagnosis interface. Various engine and chassis parameters can be measured and logged in the integrated flash card memory. Eight vibration sensor inputs allow knock detection and knock control. Four independent wide range lambda circuits allow lambda closed loop engine control.

Functionality
Injection timing
Ignition timing
Lambda control
Boost control (option)
Knock control
Data acquisition
Telemetry

Mechanical data	
Dust and waterproof aluminium housing	
Connectors in military technology	
Each pin individually filtered	
Vibration damped circuit boards	
Flexible housing fixation points	
Size	194 x 245x 71 mm
Weight	2280 g

Conditions for use	
ECU temperature	-40 … 75°C
Max. power consumption	18 W at 14 V
Max. vibration	15 g sinus at 20 Hz … 2 kHz for t < 5 h

Electronic data
In general
9 microcontrollers with 16 bit organisation, calculator capacity 70 MIPS
Real time clock

Inputs
4 inputs for Ni-Cr-Ni exhaust gas temperature sensors
4 lambda LSM 11 interfaces
4 inputs for inductive wheel speed sensors (Hall optional)
42 universal inputs 0 … 5 V
6 differential inputs ± 5 V
1 input for inductive or Hall crankshaft sensor
1 input for inductive or Hall camshaft sensor
8 knock sensor inputs
Outputs
All power stages short circuit protected
12 peak and hold injection power stages with diagnosis interface
12 switched injection power stages with diagnosis interface
12 ignition power stages with diagnosis interface
3 high current power stages (12 A)
12 high speed power stages (2 A)
3 sensor supply 5 V/100 mA
3 sensor supply 10 V/200 mA
Communication interfaces
2 RS232 interface for telemetry and laptrigger
1 2-Mbaud interface for memory and data read out or high speed telemetry
3 CAN interfaces
Memory
20/48/96 MB Compact Flash Card memory for data acquisition

Motronic MS 2.9.1

The MS 2.9.1 engine management system contains 12 ignition power stages and 12 independent injection power stages. All internal power stages are designed with a diagnosis interface. Various engine and chassis parameters can be measured and logged in the integrated flash card memory. Eight vibration sensor inputs allow knock detection and knock control. Four independent wide range lambda circuits allow lambda closed loop engine control.

Functionality
Injection timing
Ignition timing
Lambda control
Boost control (option)
Knock control
Data acquisition
Telemetry

Mechanical data	
Dust and waterproof aluminium housing	
Connectors in military technology	
Each pin individually filtered	
Vibration damped circuit boards	
Flexible housing fixation points	
Size	194 x 245 x 71 mm
Weight	2280 g

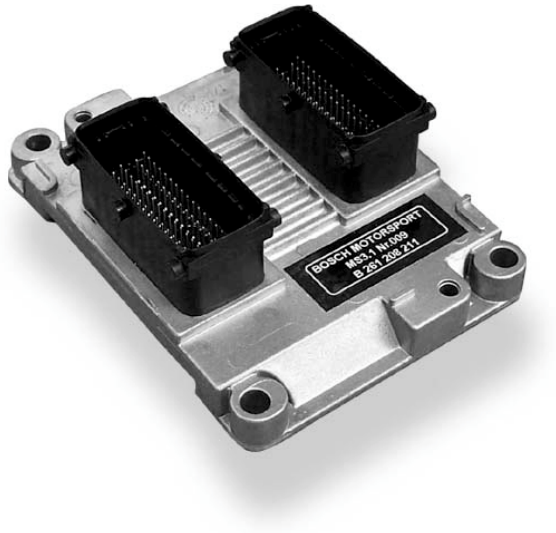
Conditions for use	
ECU temperature	-40 … 75°C
Max. power consumption	18 W at 14 V
Max. vibration	15 g sinus at 20 Hz … 2 kHz for t < 5 h

Electronic data
In general
8 microcontrollers with 16 bit organisation, calculator capacity 50 MIPS
Real time clock

Inputs
4 inputs for Ni-Cr-Ni exhaust gas temperature sensors
4 lambda LSM 11 interfaces
4 inputs for inductive wheel speed sensors (Hall optional)
42 universal inputs 0 … 5 V
6 differential inputs ± 5 V
1 input for inductive or Hall crankshaft sensor
1 input for inductive or Hall camshaft sensor
8 knock sensor inputs
Outputs
All power stages short circuit protected
12 peak and hold injection power stages with diagnosis interface
12 ignition power stages with diagnoses interface
3 high current power stages (12 A)
12 high speed power stages (2 A)
3 sensor supply 5 V/100 mA
3 sensor supply 10 V/200 mA
Communication interfaces
2 RS232 interface for telemetry and laptrigger
1 2-Mbaud interface for memory and data read out or high speed telemetry
3 CAN interfaces
Memory
20/48/96 MB Compact Flash Card memory for data acquisition

Motronic MS 3.1

The MS 3.1 is the first Bosch engine management system in full hybrid technique and for engines up to 6 cylinders. Two independent circuits are available for vibration knock detection and knock control. Injection time, injection end timing and ignition timing are calculated from basic maps and can be corrected by different engine parameters. Also two closed loop wide range lambda circuits are available. Various engine parameters can be measured with different input channels and transferred via CAN interface to an optional flash card data logger.



Functionality
Engine management system for 4- and 6-cylinder engines
Sequential fuel injection
Ignition timing
Lambda control
Knock control
Fuel cut off
Component diagnosis

Mechanical data	
Extremely small and flat aluminium pressure casting housing	
Connectors with high pin density	
Extremely shock and vibration proof hybrid technology	
Four housing fixation points	
Size	120 x 90 x 40 mm
Weight	250 g

Conditions for use	
ECU temperature	-40 … 125°C
Max. power consumption	10 W at 14 V
Max. vibration	50 g sinus at 20 Hz … 2 kHz for t < 5 h

Electronic data	
In general	
2 microcontrollers with 16 bit organisation calculation capacity 20 MIPS	
Inputs	
2 lambda LSU4 interfaces	
3 analogous inputs 0 … 5 V for water temperature, oil temperature, intake air temperature	
3 analogous inputs 0 … 5 V for oil pressure, fuel pressure, ambient pressure	
1 analogous input 0 … 5 V for throttle position sensor	
1 digital input for lap trigger	
1 digital input for wheel speed sensor	
1 input for inductive crankshaft sensor	
1 input for hall camshaft sensor	
2 knock sensor interfaces	
Outputs	
6 injection power stages with diagnosis interface	
2 high current power stages (8 A) with diagnosis interface for LSU heating	
6 ignition power stages	
Sensors supply output	5 V/100 mA
Separate supply output for throttle position sensor	5 V/100 mA
2 power stages (1 A) for main relay and fuel pump relay control	

Communication interfaces
1 CAN interface
1 K-Line interface

Order numbers	
MS 3.1 incl.INCA light	**B 261 208 211**
MS 3.1 incl. INCA expert	**B 261 208 273**
MS 3.1 incl. Modas for notebook	**B 261 208 245**

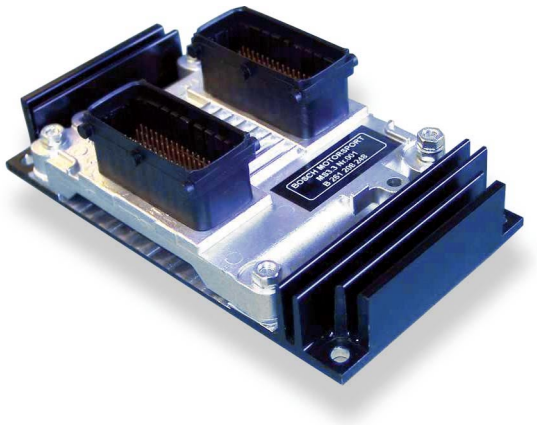
Options	
Upgrade INCA light to INCA Expert	**B 261 206 425**

Necessary equipment	
KIC2-standard connector	**B 261 206 859**
KIC2-diagnosis connector with ignition bridge	**B 261 206 866**
KIC2-diagnosis connector without ignition bridge	**B 261 206 867**

Connector	
Cable harness connector order numbers:	**D 261 205 139** **D 261 205 140**

Motronic MS 3.3

The MS 3.3 is an engine management system in full hybrid technique and for engines up to 8 cylinders. Two independent circuits are available for vibration knock detection and knock control. Injection time, injection end timing and ignition timing are calculated from basic maps and can be corrected by different engine parameters. Also two closed loop wide range lambda circuits are available. Various engine parameters can be measured with different input channels and transferred via CAN interface to an optional flash card data logger.



Functionality
Engine management system for 8-cylinder engines
Sequential fuel injection
Ignition timing
Lambda control
Knock control
Fuel cut off
Component diagnosis

Mechanical data	
Extremely small and flat aluminium pressure casting housing	
Connectors with high pin density	
Extremely shock and vibration proof hybrid technology	
Four housing fixation points	
Size	162 x 90 x 44 mm
Weight	450 g

Conditions for use	
ECU temperature	-40 … 75°C
Max. power consumption	10 W at 14 V
Max. vibration	50 g sinus at 20 Hz … 2 kHz for t < 5 h

Electronic data	
In general	
2 microcontrollers with 16 bit organisation calculation capacity 20 MIPS	
Inputs	
2 lambda LSU4 interfaces	
3 analogous inputs 0 … 5 V for water temperature, oil temperature, intake air temperature	
3 analogous inputs 0 … 5 V for oil pressure, fuel pressure, ambient pressure	
1 analogous input 0 … 5 V for throttle position sensor	
1 digital input for lap trigger	
1 digital input for wheel speed sensor	
1 input for inductive crankshaft sensor	
1 input for hall camshaft sensor	
2 knock sensor interfaces	
Outputs	
8 injection power stages with diagnosis interface	
2 high current power stages (8 A) with diagnosis interface for LSU heating	
4 ignition power stages	
Sensors supply output	5 V/100 mA
Separate supply output for throttle position sensor	5 V/100 mA
2 power stages (1 A) for main relay and fuel pump relay control	

Communication interfaces
1 CAN interface
1 K-Line interface

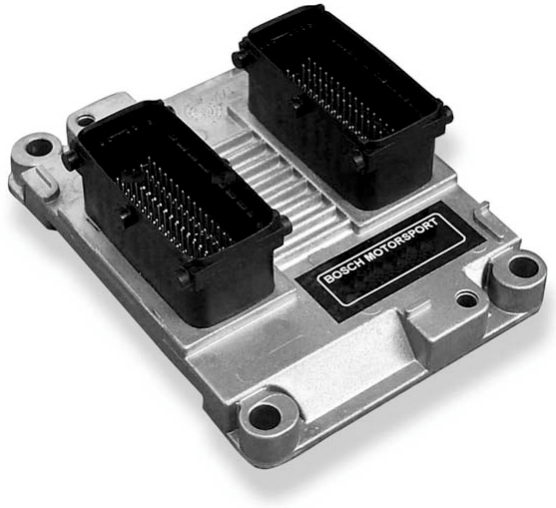
Order numbers	
MS 3.3	**B 261 208 248**
MS 3.3 incl. INCA expert	**B 261 208 249**
MS 3.3 incl. Modas for notebook	**B 261 208 250**

Necessary equipment	
KIC2-standard connector	**B 261 206 859**
KIC2-diagnosis connector with ignition bridge	**B 261 206 866**
KIC2-diagnosis connector without ignition bridge	**B 261 206 867**

Connector	
Cable harness connector order numbers:	**D 261 205 139** **D 261 205 140**

Motronic MS 3.4

The MS 3.4 is an engine management system in full hybrid technique and specially adapted for motorbikes. It allows engine speeds up to 20.000 rpm. Two independent circuits are available for vibration knock detection and knock control. Injection time, injection end timing and ignition timing are calculated from basic maps and can be corrected by different engine parameters. Also two closed loop wide range lambda circuits are available. Various engine parameters can be measured with different input channels and transferred via CAN interface to an optional flash card data logger.



Functionality
Engine management system for 4-cylinder engines
Sequential fuel injection
Ignition timing
Lambda control
Knock control
Fuel cut off
Component diagnosis
Engine speed up to 20.000 rpm
Variable firing order

Mechanical data	
Extremely small and flat aluminium pressure casting housing	
Connectors with high pin density	
Extremely shock vibration proof hybrid technology	
Four housing fixation points	
Size	120 x 90 x 40 mm
Weight	250 g

Conditions for use	
ECU temperature	-40 … 125°C
Max. power consumption	10 W at 14 V
Max. vibration	50 g sinus at 20 Hz … 2 kHz for t < 5 h

Electronic data
In general
2 microcontrollers with 16 bit organisation, calculation capacity 20 MIPS
Inputs
2 lambda LSU4 interfaces
3 analogous inputs 0 … 5 V for water temperature, oil temperature, intake air temperature
3 analogous inputs 0 … 5 V for oil pressure, fuel pressure, ambient pressure
1 analogous input 0 … 5 V for throttle position sensor
1 digital input for lap trigger
1 digital input for wheel speed sensor
1 input for inductive crankshaft sensor
1 input for hall camshaft sensor
2 knock sensor interfaces
Outputs
4 injection power stages with diagnosis interface
2 high current power stages (8 A) with diagnosis interface for LSU heating
4 ignition power stages
Sensors supply output 5 V/100 mA
Separate supply output for throttle position sensor 5 V/100 mA
2 power stages (1 A) for main relay and fuel pump relay control

Communication interfaces
1 CAN interface
1 K-Line interface

Order numbers	
MS 3.4 incl. INCA light	**B 261 208 274**
MS 3.4 incl. INCA expert	**B 261 208 275**
MS 3.4 incl. Modas	**B 261 208 276**

Necessary equipment	
KIC2-standard connector	**B 261 206 859**
KIC2-diagnosis connector with ignition bridge	**B 261 206 866**
KIC2-diagnosis connector without ignition bridge	**B 261 206 867**

Connector	
Cable harness connector order numbers:	**D 261 205 139** **D 261 205 140**

Motronic MS 4.0

The MS 4.0 is a highly sophisticated engine management system for high performance engines. The system contains 8 ignition drivers for external power stages and 8 independent injection power stages. Various engine and chassis parameters can be measured with the different input channels. Two vibration sensor inputs allow knock detection and knock control. Two independent wide range lambda circuits allow lambda closed loop engine control.

Mechanical data	
Sheet-metal housing	
Each connector pin individually filtered	
Vibration damped circuit boards	
Size	180 x 162 x 46 mm
Weight	430 g

Conditions for use	
Temperature range	-40 … 75°C
Max. power consumption	30 W at 14 V
Max. vibration	15 g sinus at 20 Hz …2 kHz for t < 5 h

Functionality
Injection timing
Ignition timing
Lambda control
Knock control
Data acquisition
Telemetry
Traction control
Turbo functionality

Electronic design
Inputs
2 inputs for exhaust gas temperature sensors
2 lambda interfaces LSU
4 inputs for Hall effect wheel speed sensors
1 input for inductive or Hall effect crankshaft sensor
16 universal inputs 0 … 5 V
2 inputs for vibration knock sensors
7 digital inputs
Outputs
8 injection power stages
8 ignition drivers
20 power stages (2,7 A/0,6 A; low side; PWM)
2 power stages for lambda heater
1 H-bridge (5 A)
2 sensor supply 5 V/100 mA
Communication interfaces
1 K-line serial interfaces
2 CAN interfaces for external communication

Motronic MS 4.1

The MS 4.1 is a highly sophisticated engine management system for high performance engines. The system contains 8 ignition drivers for external power stages and 16 independent injection power stages. Various engine and chassis parameters can be measured with the different input channels and logged on the internal data logger. Two vibration sensor inputs allow knock detection and knock control. Two independent wide range lambda circuits allow lambda closed loop engine control.

Mechanical data	
Dust and waterproof aluminium housing	
3 connectors in military technology with high pin density	
165 pins, each pin individually filtered	
Vibration damped circuit boards	
8 flexible housing fixation points	
Size	180 x 162 x 46 mm
Weight	765 g

Conditions for use	
Temperature range	-40 … 75°C
Max. power consumption	30 W at 14 V
Max. vibration	15 g sinus at 20 Hz …2 kHz for t<5 h

Functionality
Injection timing
Ignition timing
Lambda control
Knock control
Data acquisition
Telemetry
Traction control
Turbo functionality

Electronic design
Inputs
2 inputs for exhaust gas temperature sensors
2 lambda interfaces LSU
4 inputs for Hall effect wheel speed sensors
1 input for inductive or Hall effect crankshaft sensor
31 universal inputs 0 … 5 V
2 inputs for vibration knock sensors
7 digital inputs
Outputs
16 injection power stages
8 ignition power stages
26 power stages (2,7 A/0,6 A; low side; PWM)
2 power stages for lambda heater
1 H-bridge (5 A)
2 sensor supply 5 V/100 mA
Communication interfaces
1 RS232 serial interface
2 K-line serial interfaces
2 CAN interfaces for external communication
1 SPI
Memory
Internal memory up to 48 MB for data acquisition

Sensors

Pressure Sensors Air

Absolute Pressure Sensor PS-10

Pressure range: 10 x 0,1 … 2,5 bar nominal

The pressure box is designed for measuring air pressure and specially modified for motorsport use. With its 10 analogous outputs it can take 10 measurements simultaneously.

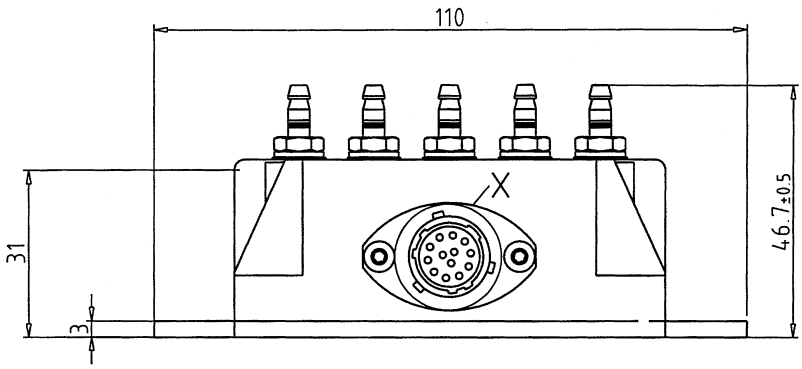
Mechanical data	
Measurement transducer	piezoresistive
Pressure range	10 x 0,1 … 2,5 bar nominal
Max. pressure	10 bar nominal
Weight	185 g
Dimensions	110 x 87 x 47 mm
Sensor connector	3 mm

Conditions for use	
Temperature range	-40 … 125°C
Max. vibration	15 g /30 … 200 Hz

Characteristic
Sensitivity and offset will be delivered with each sensor

Electronic data	
Power supply	12 V
Compensated range	20 … 85°C
Non linearity	1,00 %
Therm. zero point drift	< 1,00 %
Therm. sensitivity drift	< 1,00 %
Long time drift	< 1,00 %
Full scale output	0,5 … 4,5 V
Time of reaction	1 ms (90 %)

Order number	
AS 0-10-35PN	**B 261 206 865**
Offer drawing	**A 261 206 865**



Absolute Pressure Sensor PSA

Pressure range: 0,2 … 1,05 / 2,5 bar nominal

A piezoresistive pressure sensor for ambient air pressure measurement.

Mechanical data	
Measurement transducer	piezoresistive
Max. pressure	5 bar
Thread	M6
Weight	60 g

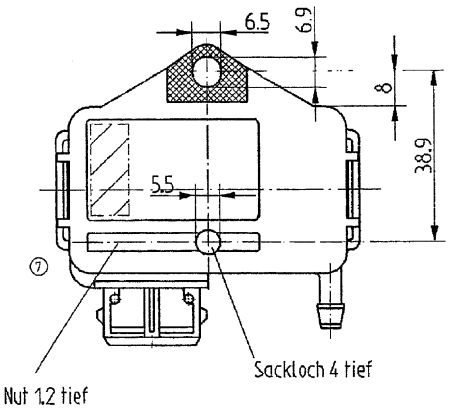
Conditions for use	
Temperature range	-40 … 120°C
Max. temp. of location	130°C
Max. vibration	15 g /30 … 200 Hz

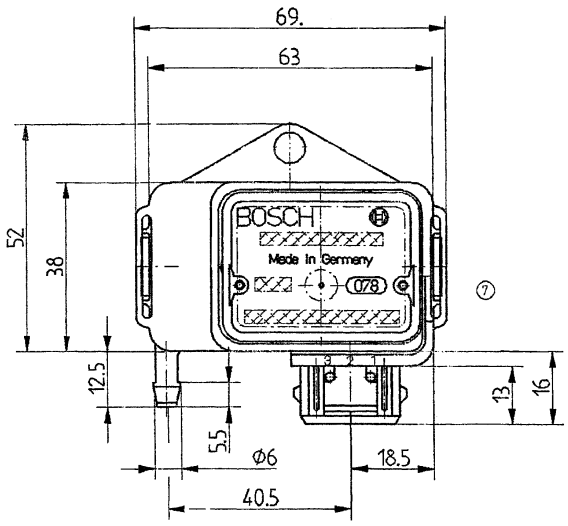
Characteristic	
0,2 … 1,05 bar:	
Sensitivity	5000 mV/bar
Offset	-600 mV
0,2 … 2,5 bar:	
Sensitivity	1847 mV/bar
Offset	30 mV

Electronic data	
Power supply	4,75 … 5,25 V
Full scale output	0,4 … 4,65 V
Time of reaction	10 ms (90 %)
Max. current	< 10 mA
Resistance	> 50 kΩ

Connector	
Cable harness connector	**1 237 000 039**

Order numbers	
0,2 … 1,05 bar	**0 261 230 004**
Offer drawing	**A 261 260 041**
0,2 … 2,5 bar	**0 281 002 119**
Offer drawing	**A 261 260 047**





Absolute Pressure Sensor PSA-B

Pressure range: 0,1 … 1,15 / 0,2 … 2,5 bar nominal

A piezoresistive pressure sensor modified for precision air pressure measurement, especially air box pressure. It is manufactured in a DR-25 sleeve, various connector options are available.

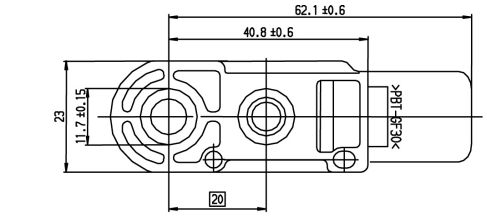
Mechanical data	
Max. pressure	3 [5] bar
Fitting	11,85 mm
Weight	45 g
Sealing	O-ring 7,59 x 2,62

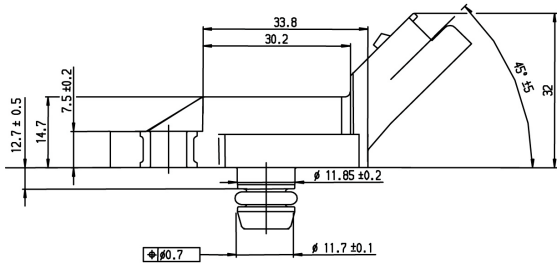
Conditions for use	
Temperature range	-40 … 125°C
Max. temp. of location	130°C
Max. vibration	250 g/200 … 500 Hz

Characteristic	
0,1 … 1,15 bar:	
Sensitivity	4040 mV/bar
Offset	-4,8 mV
0,2 … 2,5 bar:	
Sensitivity	1848 mV/bar
Offset	30,4 mV

Electronic data	
Power supply	4,75 … 5,25 V
Full scale output	0,1 … 4,65 V
Compensated range	40 … 130°C
Non linearity	0,25 %
Therm. zero point drift	< 0,5 %
Therm. sensitivity drift	< 0,5 %
Long time drift	< 0,5 %

Order numbers	
0,1 … 1,15 bar:	
AS 6-06-05PC-HE	**B 261 209 702**
Offer drawing	**A 261 209 702**
0,2 … 2,5 bar:	
AS 6-06-05PC-HE	**B 261 209 710**
Offer drawing	**A 261 260 710**





Absolute Pressure Sensor PSB-2

Pressure range: 0,1 … 2 bar nominal

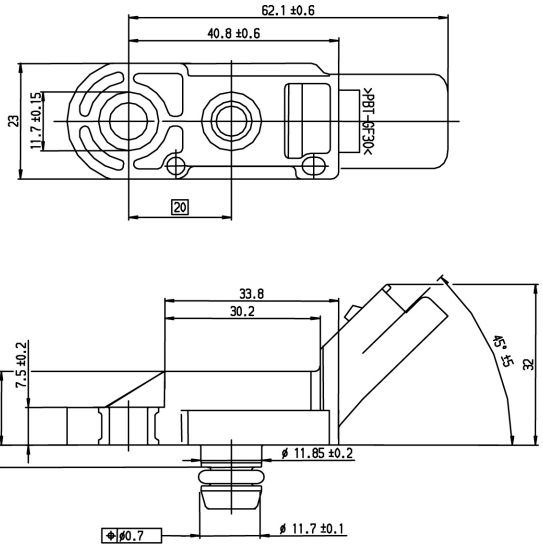
An absolute pressure sensor modified for precision air pressure measurement, especially boost pressure. It is manufactured in a DR-25 sleeve, various connector options are available.

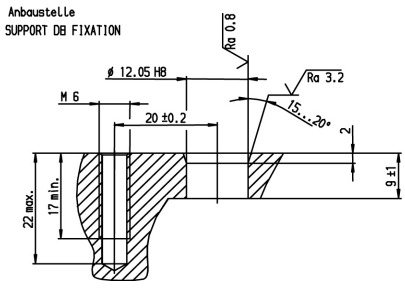
Mechanical data	
Max. pressure	3 bar
Fitting	11,85 mm
Weight	45 g
Sealing	O-ring 7,59 x 2,62

Order number	
AS 6-06-05PC-HE	**B 261 209 337**
Offer drawing	**A 261 260 123**

Conditions for use	
Temperature range	-40 … 125°C
Max. temp. of location	130°C
Max. vibration	250 g /200 … 500 Hz

Electronic data	
Power supply	5 V
Compensated range	40 … 130°C
Non linearity	0,25 %
Therm. zero point drift	< 0,5 %
Therm. sensitivity drift	< 0,5 %
Long time drift	< 0,5 %
Full scale output	0,4 … 4,65 V





Absolute Pressure Sensor PSB-4

Pressure range: 0,5 … 4 bar nominal

An absolute pressure sensor modified for precision air pressure measurement, especially boost pressure. It is manufactured in a DR-25 sleeve, various connector options are available.

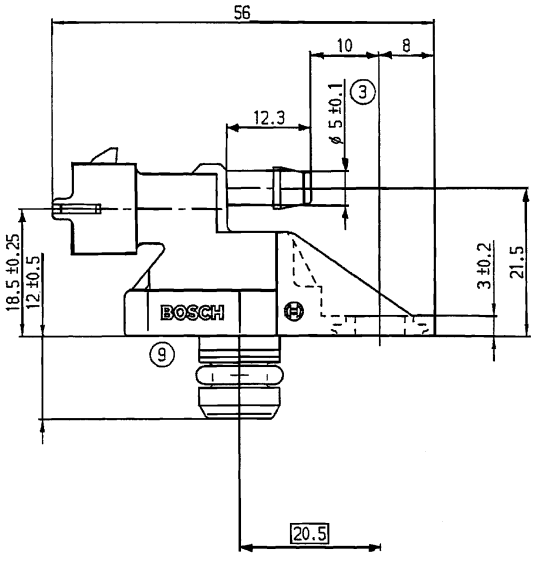
Mechanical data	
Max. pressure	4,5 bar
Fitting	11,85 mm
Weight	45 g
Sealing	O-ring 7,59 x 2,62

Conditions for use	
Temperature range	-40 … 80°C
Max. temp. of location	130°C
Max. vibration	8 g /10 … 1000 Hz

Characteristic
Sensitivity and offset will be delivered with each sensor.

Electronic data	
Power supply	5 V
Compensated range	-40 … 80°C
Non linearity	0,25 %
Therm. zero point drift	< 0,5 %
Therm. sensitivity drift	< 0,5 %
Long time drift	< 0,5 %
Full scale output	0,5 … 4,5 V

Order number	
AS 6-06-05PC-HE	**B 261 209 338**
Offer drawing	**A 261 260 302**



Absolute Pressure Sensor PSP

Pressure range: 0,2 … 3 bar nominal

An absolute pressure sensor modified for precision air pressure measurement.

Mechanical data	
Max. pressure	5 bar
Characteristic	20°C/2,5 kΩ
Fitting	∅ 11,8 mm
Weight	17 g
Sealing	O-ring

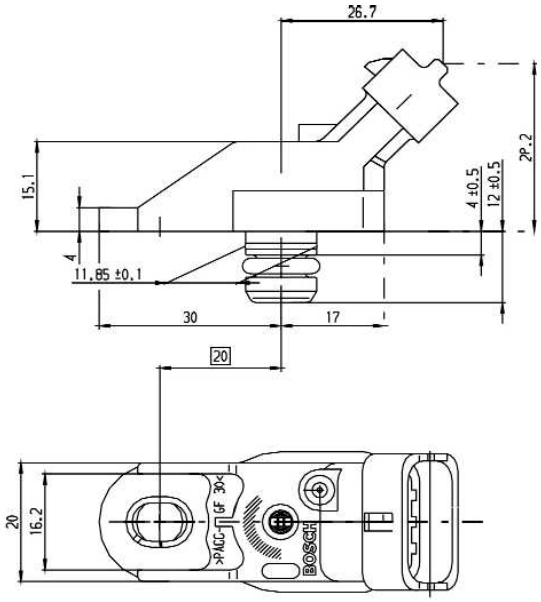
Conditions for use	
Temperature range	-40 … 130°C
Max. vibration	4 g/20 … 71 Hz
Max. temp. of location	130 °C

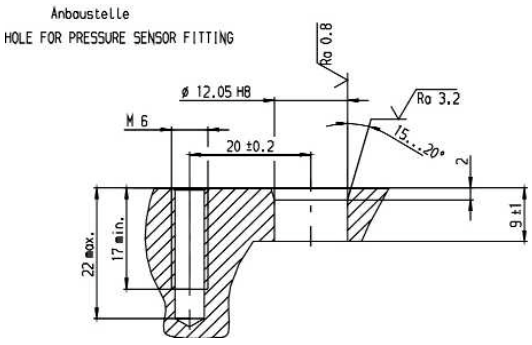
Characteristic	
Sensitivity	1517 mV/bar
Offset	96 mV

Electronic data	
Power supply	5 V
Compensated range	-40 … 125°C
Non linearity	0,25 %
Therm. zero point drift	< 0,5 %
Therm. sensitivity drift	< 0,5 %
Long time drift	< 0,5 %
Full scale output	0,4 … 4,65 V

Connector	
Cable harness connector	**1 928 402 868**

Order number	
AS 6-06-05PC-HE	**B 261 209 690**
Offer drawing	**A 261 260 139**





Absolute Pressure Sensor PST

Pressure range: 0,1 … 1,15 bar nominal

An absolute pressure sensor with integrated temperature sensor for ambient air and various fluid pressure measurements.

Mechanical data	
Max. pressure	2,3 bar
Characteristic	20°C/2,5 kΩ
Fitting	∅ 17,6 mm
Weight	35 g
Sealing	O-ring 7,65 x 1,63

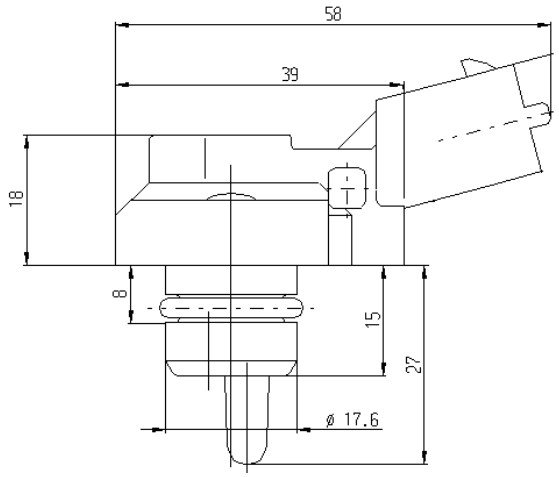
Conditions for use	
Temperature range	-40 … 125°C
Vibration	250 g/200 … 500 Hz
Max. temp. of location	130°C

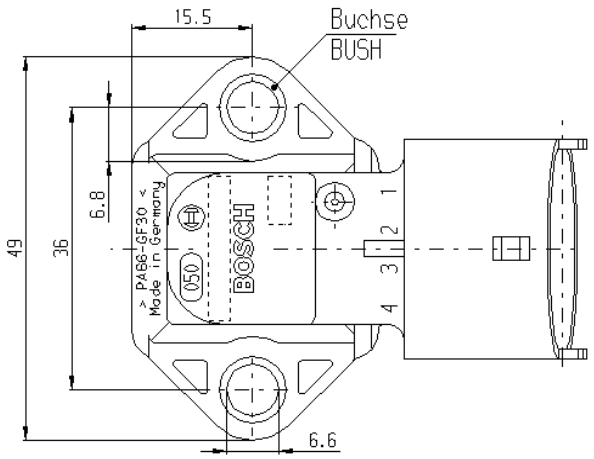
Characteristic	
Sensitivity	4048 mV/bar
Offset	-4,76 m

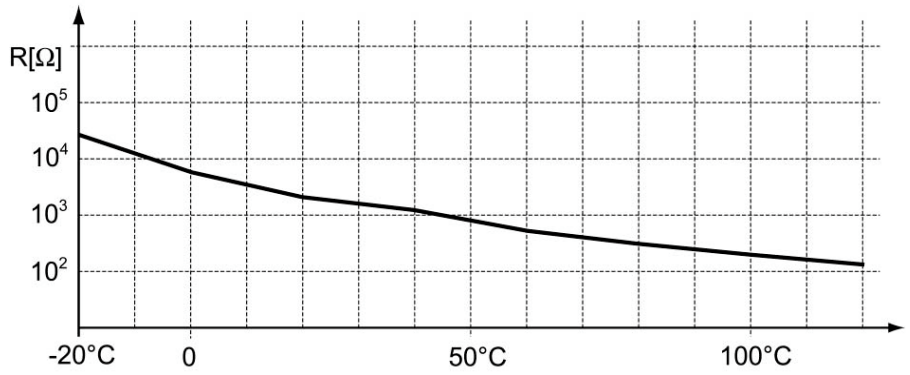
Electronic data	
Power supply	5 V
Compensated range	-40 … 125°C
Non linearity	0,25 %
Therm. zero point drift	< 0,5 %
Therm. sensitivity drift	< 0,5 %
Long time drift	< 0,5 %
Full scale output	0,4 … 4,65 V

Connector	
Cable harness connector	**1 928 403 112**

Order number	
	0 261 230 022
Offer drawing	**A 261 260 253**







°C	R(Ω)
-40	45 313
-35	34 281
-30	26 114
-25	20 003
-20	15 462
-15	12 002
-10	9 397
-5	7 415
0	5 896
5	4 712
10	3 792
15	3 069
20	2 500
25	2 057
30	1 707
35	1 412
40	1 175
45	987,6
50	833,9
55	702,8
60	595,5

°C	R(Ω)
65	508,3
70	435,7
75	374,2
80	322,5
85	279,6
90	243,2
95	212,7
100	186,6
105	163,8
110	144,2
115	127,3
120	112,7
125	100,2
130	89,30
135	79,65
140	71,20
145	63,86
150	57,41
155	51,82
160	46,88

Pressure Sensors Fluid

Absolute Pressure Sensor PSC-10

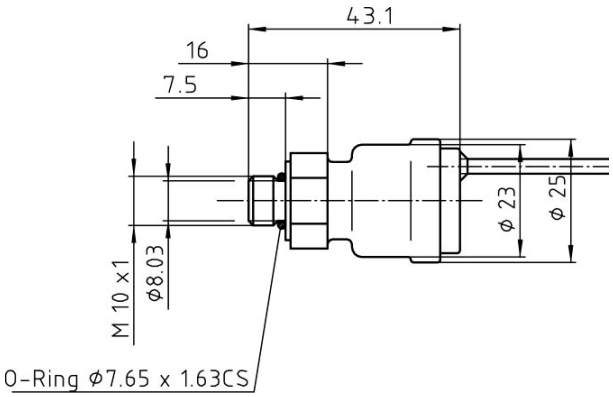
Pressure range: 0 … 10 bar nominal

A M10 x 1 sensor for various fluid pressure measurement. The sensor range covers pressure measurement up to 10 bar. It is manufactured in a DR-25 sleeve, various connector options are available. Gauge and absolute pressure sensors are available.

Mechanical data	
Measurement transducer	piezoresistive
Max. pressure	20 bar
Thread	M10 x 1
Tightening torque	10 Nm
Wrench size	17 mm
Weight	70 g
Sealing	O-ring 7,65 x 1,63

Conditions for use	
Temperature range	-40 … 125°C
Max. vibration	15 g/30 … 200 Hz

Characteristic	
Sensitivity	400 mV/bar
Offset	100 mV



Electronic data	
Power supply	5 … 6 V/8 … 16 V
Compensated range	25 … 85 °C
Non linearity	1 %
Therm. zero point drift	< 1 %
Therm. sensitivity drift	< 1 %
Long time drift	< 1 %
Full scale output	0,5 … 4,5 V
Time of reaction	1 ms (90 %)

Order numbers	
5 … 6 V supply	
KPTA 6E6-4P-C-DN	**B 261 209 342**
Offer drawing	**A 261 209 342**
8 … 16 V supply	
KPTC 6E8-4P-C-DN	**B 261 209 063**
Offer drawing	**A 261 209 063**
AS 6-06-05PN	**B 261 209 068**
Offer drawing	**A 261 209 068**
KPTA 6E6-4P-C-DN	**B 261 209 069**
Offer drawing	**A 261 209 069**
AS 6-08-98PN	**B 261 209 077**
Offer drawing	**A 261 209 077**
AS 6-06-05PC-HE	**B 261 209 079**
Offer drawing	**A 261 209 079**

Absolute Pressure Sensor PSC-250

Pressure range: 0 … 250 bar nominal

A M10 x 1 sensor for various fluid pressure measurement. The sensor range covers pressure measurement from 0 to 250 bar. It is manufactured in a DR-25 sleeve, various connector options are available. Gauge and absolute pressure sensors are available.

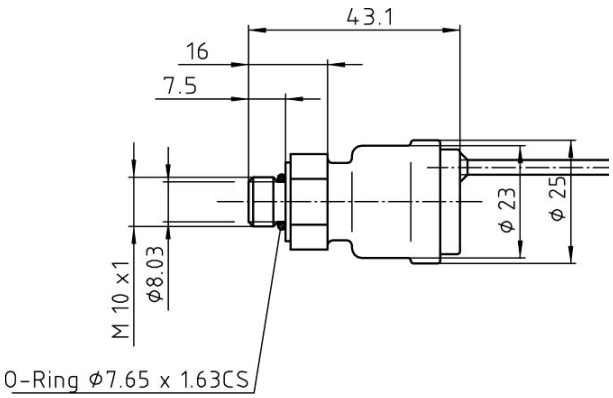
Mechanical data	
Measurement transducer	piezoresistive
Max. pressure	500 bar
Thread	M10 x 1
Tightening torque	10 Nm
Wrench size	17 mm
Weight	70 g
Sealing	O-ring 7,65 x 1,63

Electronic data	
Power supply	8 … 16 V
Compensated range	25 … 85°C
Non linearity	1 %
Therm. zero point drift	< 1 %
Therm. sensitivity drift	< 1 %
Long time drift	< 1 %
Full scale output	0,5 … 4,5 V
Time of reaction	1 ms (90 %)

Conditions for use	
Temperature range	-40 … 125°
Max. vibration	15 g/30 … 200 Hz

Characteristic	
Sensitivity	16 mV/bar
Offset	500 mV

Order numbers	
KPTC 6E8-4P-C-DN	**B 261 209 066**
Offer drawing	**A 261 209 066**
KPTA 6E6-4P-C-DN	**B 261 209 076**
Offer drawing	**A 261 209 076**
AS 6-08-98PN	**B 261 209 078**
Offer drawing	**A 261 209 078**



Absolute Pressure Sensor PSM

Pressure range: 0 … 2 / 12 / 250 bar nominal

A miniature M10 x 1 absolute pressure sensor for universal precision pressure measurement. It is manufactured in a DR-25 sleeve, various connector options are available. Detailed calibration sheet included.

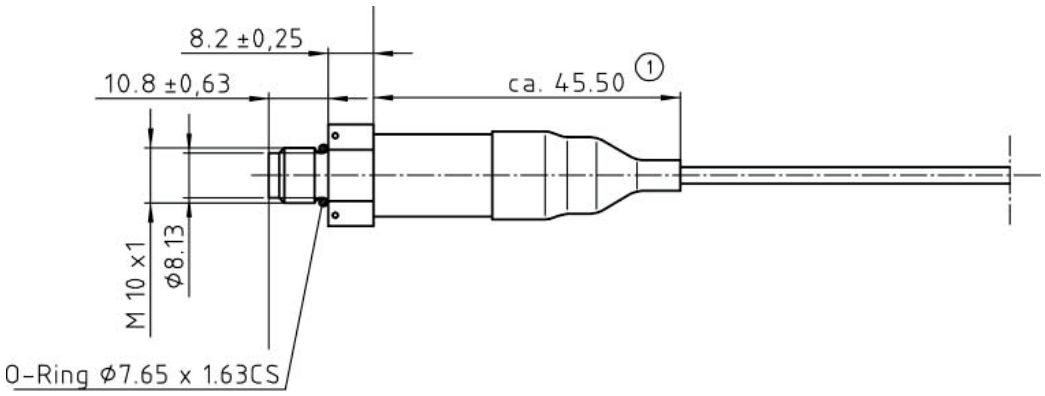
Mechanical data	
Max. pressure	2 x nominal
Thread	M10 x 1
Tightening torque	10 Nm
Wrench size	16 mm
Weight	55 g
Sealing	O-ring 7,65 x 1,63

Electronic data	
Power supply	8 … 16 V
Compensated range	20 … 80°C
Non linearity	0,25 %
Therm. zero point drift	< 0,5 %
Therm. sensitivity drift	< 0,5 %
Long time drift	< 0,5 %
Full scale output	0 … 5 V

Conditions for use	
Temperature range	-20 … 125°C
Vibration	80 g/5 Hz … 2,5 kHz

Characteristic
Sensitivity and offset will be delivered with each sensor.

Order numbers	
AS 6-06-05PC-HE	
2 bar	**B 261 209 335**
Offer drawing	**A 261 209 330**
12 bar	**B 261 209 331**
Offer drawing	**A 261 209 331**
250 bar	**B 261 209 332**
Offer drawing	**A 261 209 332**



Absolute Pressure Sensor PSS

Pressure range: 0 … 10 / 100 / 250 bar nominal

A M10 x 1 pressure sensor for measuring various fluid pressure. Gauge and absolute pressure sensors are available.

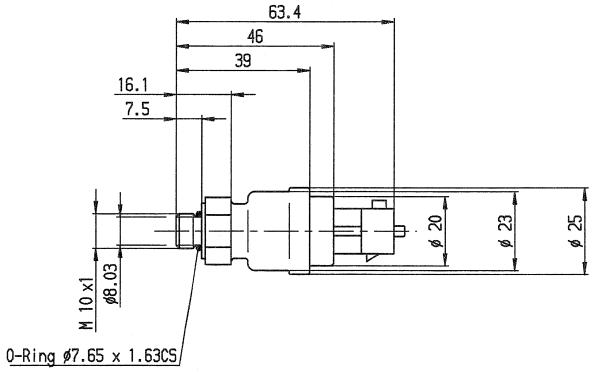
Mechanical data	
Measurement transducer	piezoresistive
Max. pressure	2 x nominal
Thread	M10 x 1
Tightening torque	10 Nm
Wrench size	17 mm
Weight	65 g
Sealing	O-ring 7,65 x 1,63

Conditions for use	
Temperature range	-40 … 125°C
Vibration	15 g/30 … 200 Hz

Characteristic	
Sensitivity	
10 bar	400mV/bar
100 bar	40 mV/bar
250bar	16 mV/bar
Offset	
10 bar	100 mV/bar
100 bar	500 mV/bar
250 bar	500 mV/bar

Electronic data	
Power supply	5 … 6 V/ 8 … 16 V
Compensated range	20 … 85°C
Non linearity	1 %
Therm. zero point drift	< 1 %
Therm. sensitivity drift	< 1 %
Long time drift	< 1 %
Full scale output	0,5 … 4,5 V
Time of reaction	1 ms (90%)

Order numbers	
5 … 6 V supply, 10 bar	**B 261 209 341**
Offer drawing	**A 261 209 341**
8 … 16 V supply, 10 bar	**B 261 209 064**
Offer drawing	**A 261 209 064**
5 …6 V supply, 100 bar	**B 261 209 347**
Offer drawing	**A 261 209 347**
8 … 16 V supply, 250 bar	**B 261 209 067**
Offer drawing	**A 261 209 067**



Pressure Sensors differential

Differential Pressure Sensors DP

Pressure range: 0 … 100 mbar differential

These miniature differential pressure sensors are used for precision air pressure measurement. They are typically combined with a pitot tube.

Type A

Type B

Mechanical data	
Dimensions	
Type A	37 x 28 x 19 mm
Type B	38 x 28 x 19 mm
Fixing	2 x M3
Tightening torque	2 Nm
Weight	28 g

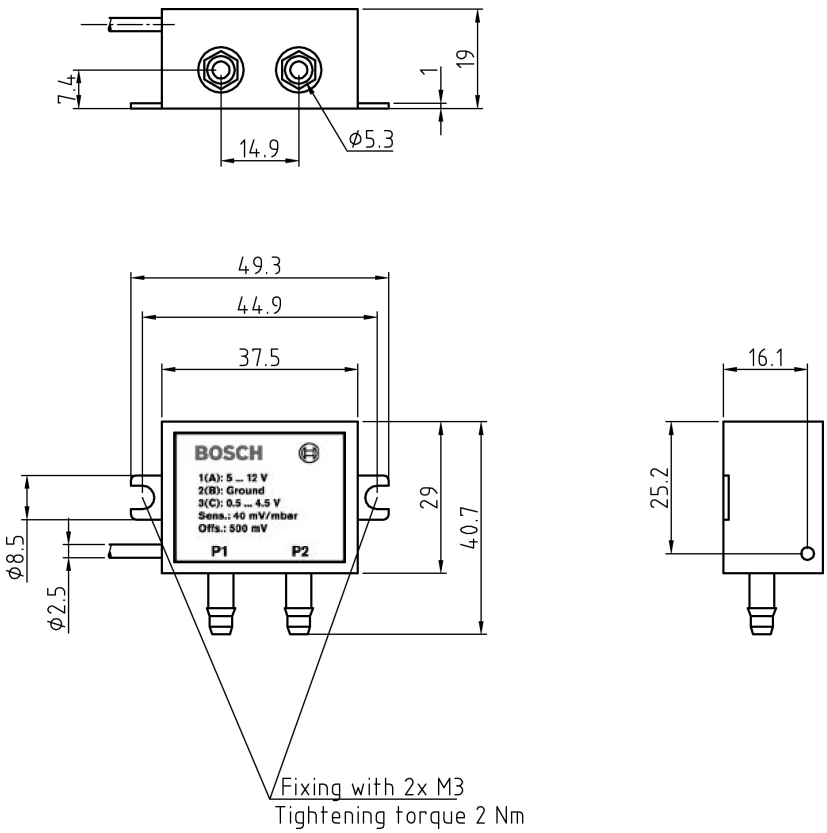
Conditions for use	
Temperature range	-20 … 70°C

Characteristic	
Sensitivity	40 mV/mbar
Offset	500 mV

Electronic data	
Power supply	4,8 … 15 V
Output current	10 mA
Compensated range	0 … 50°C
Non linearity	0,5 %/FSO
Therm. zero point drift	0,05 %/FSO/°C
Therm. sensitivity drift	0,05 %/FSO/°C
Long time drift	± 0,20 %/FSO
Full scale output	0,5 … 4,5 V

Accessories	
Pitot tube	**B 261 209 700**

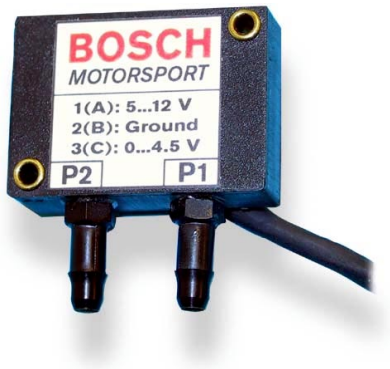
Order numbers	
Type A	
AS 0-06-05PC-HE	**B 261 209 696**
Offer drawing	**A 261 209 696**
Type B	
AS 0-06-05PC-HE	**B 261 209 697**
Offer drawing	**A 261 209 697**


7.4
14.9
ϕ5.3
1
19
49.3
44.9
37.5
BOSCH
1(A): 5 ... 12 V
2(B): Ground
3(C): 0.5 ... 4.5 V
Sens.: 40 mV/mbar
Offs.: 500 mV
P1
P2
29
40.7
ϕ8.5
ϕ2.5
16.1
25.2
Fixing with 2x M3
Tightening torque 2 Nm

Differential Pressure Sensor DP-C

Pressure range: 0 … 100 mbar differential

This low cost miniature differential pressure sensor is used for precision air pressure measurement. It is typically combined with a pitot tube.



Mechanical data	
Dimensions	35 x 25 x 11 mm
Pressure ranges	100 mbar differential
Fixing	2 x M2,5
Tightening torque	2 Nm
Weight	28 g

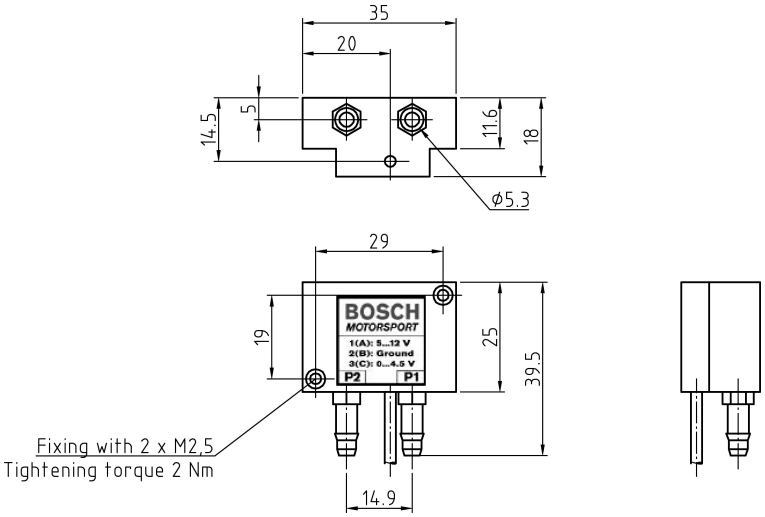
Conditions for use	
Temperature range	-20 … 70°C

Characteristic	
Sensitivity	40 mV/mbar
Offset	500 mV

Electronic data	
Power supply	4,8 … 15 V
Output current	10 mA
Compensated range	0 … 50°C
Non linearity	0,5 %/FSO
Therm. Zero point drift	0,05 %/FSO/°C
Therm. sensitivity drift	0,05 %/FSO/°C
Long time drift	± 0,20 %/FSO
Full scale output	0,5 … 4,5 V

Accessories	
Pitot tube	**B 261 209 700**

Order number	
AS 0-06-05PC-HE	**B 261 209 701**
Offer drawing	**A 261 209 701**



Differential Pressure Sensor DP-E

Pressure range: 0 … 70 / 0 … 100 mbar differential

A miniature differential pressure sensor for precision temperature compensated air pressure measurement. It is typically used as pitot tube sensor.

Mechanical data	
Dimensions	62 x 33 x 21 mm
Fixing	2 x M3
Tightening torque	2 Nm
Weight	50 g

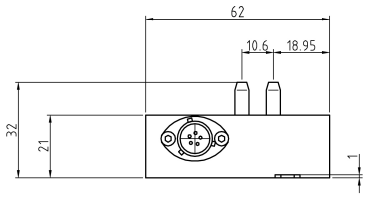
Conditions for use	
Temperature range	-20 … 70°C

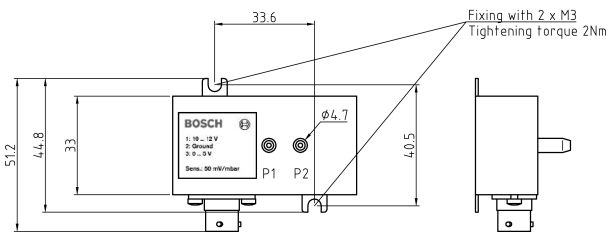
Characteristic	
Sensitivity	
0 … 70 mbar	50 mV/mbar
0 … 100 mbar	71,42 mV/mbar

Accessories	
Pitot tube	**B 261 209 700**

Electronic data	
Power supply	7,5 … 24 V
Compensated range	0 … 70°C
Non linearity	0,25 %/FSO
Therm. zero point drift	0,30 %/FSO
Therm. sensitivity drift	0,20 %/FSO
Long time drift	0,10 %/FSO
Full scale output	0 … 5 V

Order numbers	
0 … 70 mbar	
AS 0-06-05PN-HE	**B 261 209 698**
Offer drawing	**A 261 209 698**
0 … 100 mbar	
AS 0-06-05PN-HE	**B 261 209 699**
Offer drawing	**A 261 209 699**



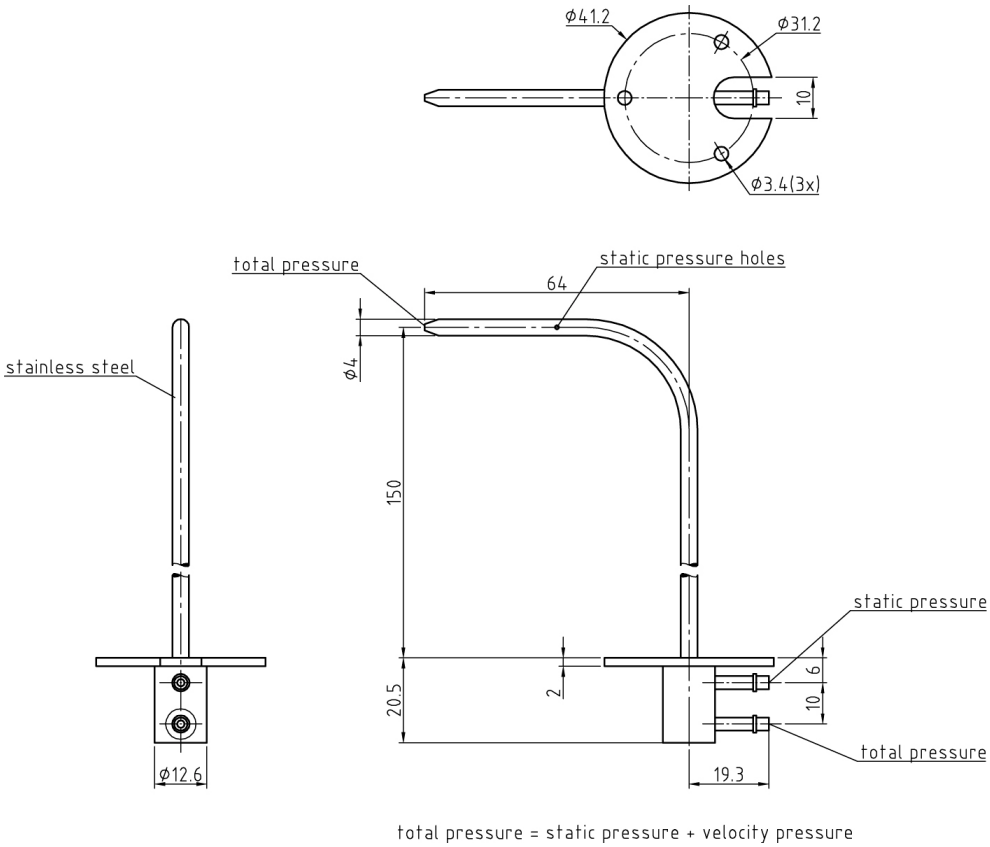


Pitot Static Tube PT

The pitot static tube consists basically of two concentric tubes, with the end turned through a right angle so that the tip can be faced into the air stream after insertion through the duct wall. The modified ellipsoidal nose form has a single forward facing hole for sensing total pressure and a ring of side holes for sensing the static pressure. Both these inlets are individually connected to tapping outlets at the tail of the unit. A direction pointer is provided so that the pitot tube can be accurately aligned within the duct.

Mechanical data	
Weight	50 g
Height	150 mm
Tube diameter	4 mm

Order number	
	B 261 209 700
Offer drawing	**A 261 209 700**



total pressure = static pressure + velocity pressure

Air Velocity Calculations using S.I. Scales

The Standard formula for calculating velocity from velocity pressure is:

$$V = 1.291 \sqrt{Pv}$$

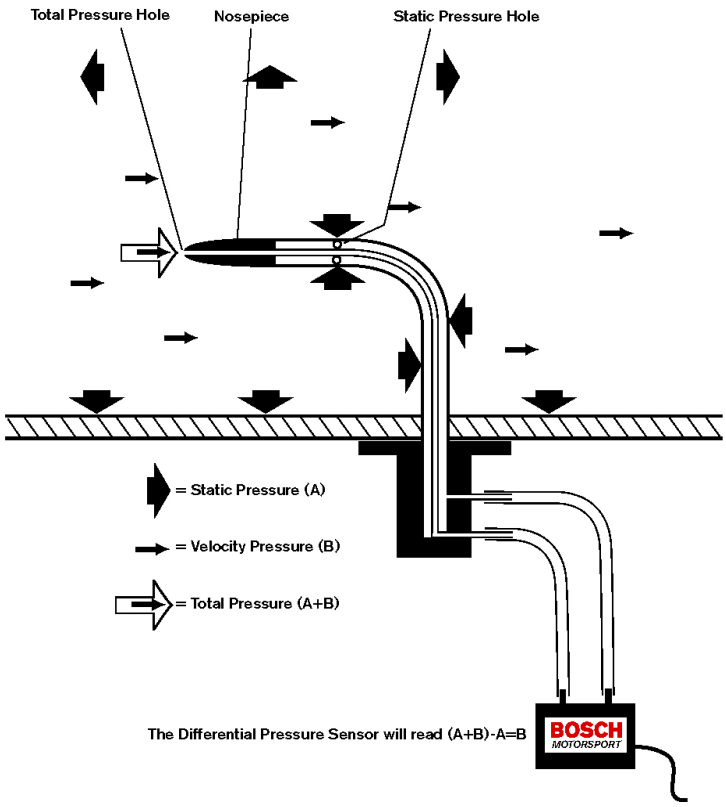
This is only correct for an air density of 1.2 kg/m³. For non-standard air conditions, this equation becomes:

$$V = 1.291 \sqrt{\frac{1013 \quad .25}{B}} * \frac{T}{293} * \frac{100000}{100000 \quad + \quad Ps} * Pv$$

V = velocity m/s
B = barometric pressure mbar
T = absolute temperature K (= t°C + 273 where t is airstream temperature)
Ps = static pressure Pa
Pv = velocity pressure Pa

The expression $\frac{100000}{100000 + Ps}$ is a correction for the static pressure in the duct and may normally be ignored if Ps is less than 2500 Pa

Principle of Operation



Temperature Sensors

Temperature Sensor NTC M6

Temperature range: 0 … 200°C

A miniature M6 x 1 NTC sensor for fast response temperature measurement. It is manufactured in a DR-25 sleeve, various connector options are available.

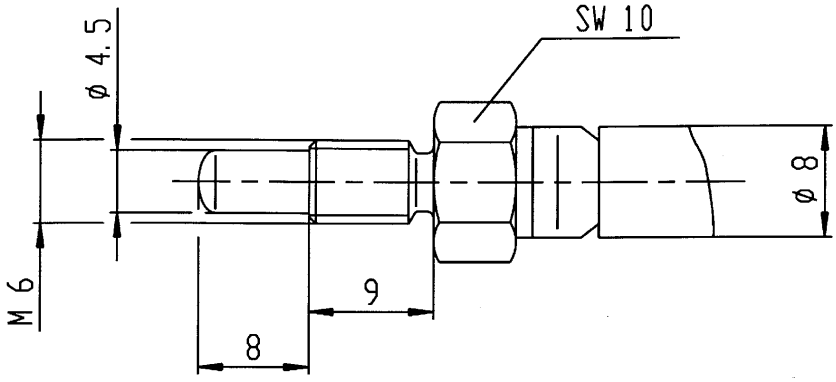
Mechanical data	
Thread	M6 x 1
Tightening torque	3 Nm
Wrench size	10 mm
Sealing	Viton 4,47 x 1, 78
Weight	45 g

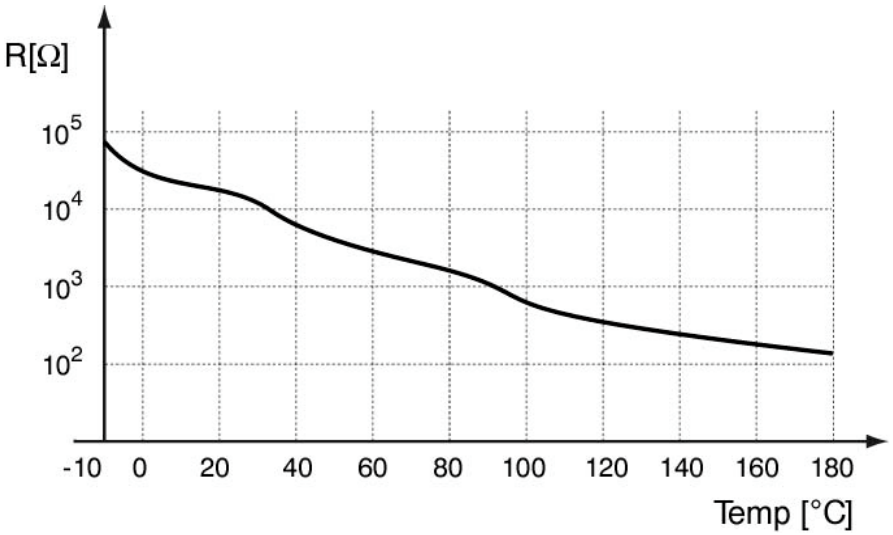
Conditions for use	
Temperature range	-30 … 200°C
Vibration	80 g/5 … 500 Hz

Characteristic
NTC 15 kΩ

Electronic data	
Nominal resistance	15 kΩ/25°C
Measuring range	0 … 200°C
Accuracy	± 1,0 K
Response time 90 %	< 7 s

Order numbers	
KPTA 6E6-4P-C-DN	**B 261 209 172**
Offer drawing	**A 261 209 172**
AS 6-06-05PN-HE	**B 261 209 386**
Offer drawing	**A 261 209 386**





°C	R(Ω)
-10	83317,5
0	49254,0
10	29959,5
20	18732,0
30	12012,0
40	7893,0
50	6651,0
60	5356,5
70	2544,0
80	1804,5

°C	R(Ω)
90	1305,5
100	945,0
110	703,5
120	526,5
130	400,5
140	309,0
150	240,0
160	187,5
170	148,5
180	120,0

Temperature Sensor NTC M6-F

Temperature range 0 … 125°C

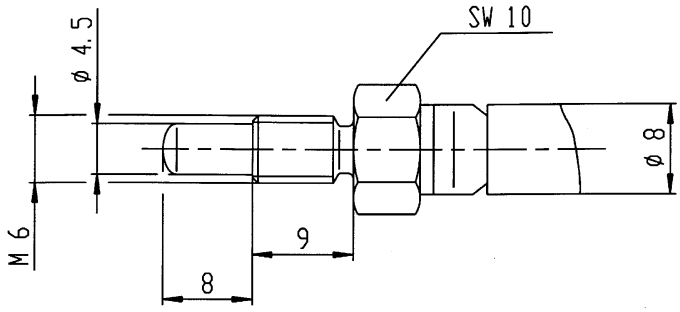
The NTC M6-F is a development based on the NTC M6. It is created for very fast response air temperature measurement.

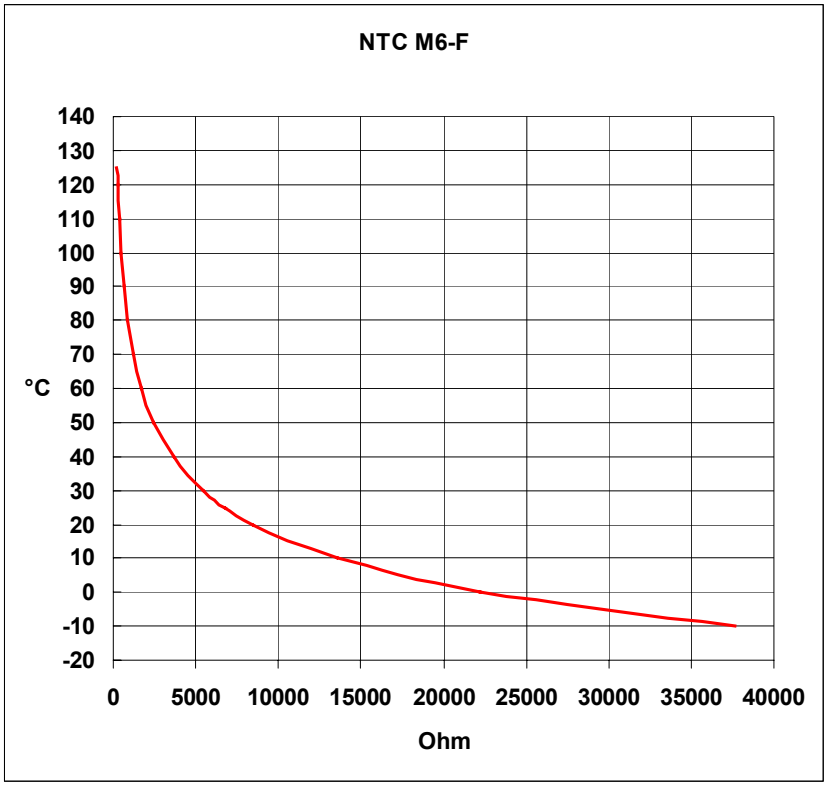
Mechanical data	
Thread	M6 x 1
Tightening torque	3 Nm
Wrench size	10 mm
Sealing	Viton 4,47 x 1,78
Weight	42 g

Electronic data	
Nominal resistance	6,8 kΩ/25°C
Measuring range	0 … 125°C
Accurancy	± 1,0 K
Response time 90 %	≤ 2 s

Conditions for use	
Temperature range	-40 … 125°C
Max. vibration	70 g/5 … 500 Hz

Order number	
AS6-06-05PN-HE	**B 261 209 398**
Offer drawing	**A 261 209 398**





°C	R(Ω)
-20	66115
10	37645
0	22209
10	13533
20	8495
30	5479
40	3624
50	2452

°C	R (Ω)
60	1695
70	1195
80	858,2
90	626,7
100	464,8
110	350,4
120	267,1

Temperature Sensor NTC M8

Temperature range: 0 … 200°C

This standard fluid temperature sensor combines temperature response with fine mechanical properties. It is manufactured in a DR-25 sleeve, various connector options are available.

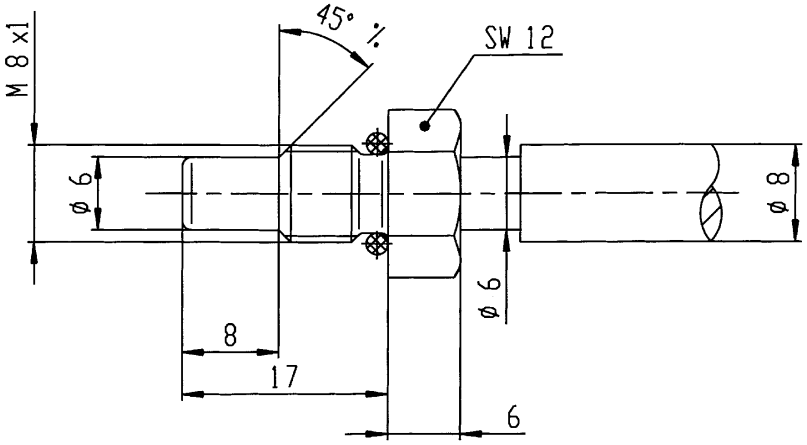
Mechanical data	
Thread	M8 x 1
Tightening torque	3 Nm
Wrench size	12 mm
Sealing	Viton 7,65 x 1, 63
Weight	45 g

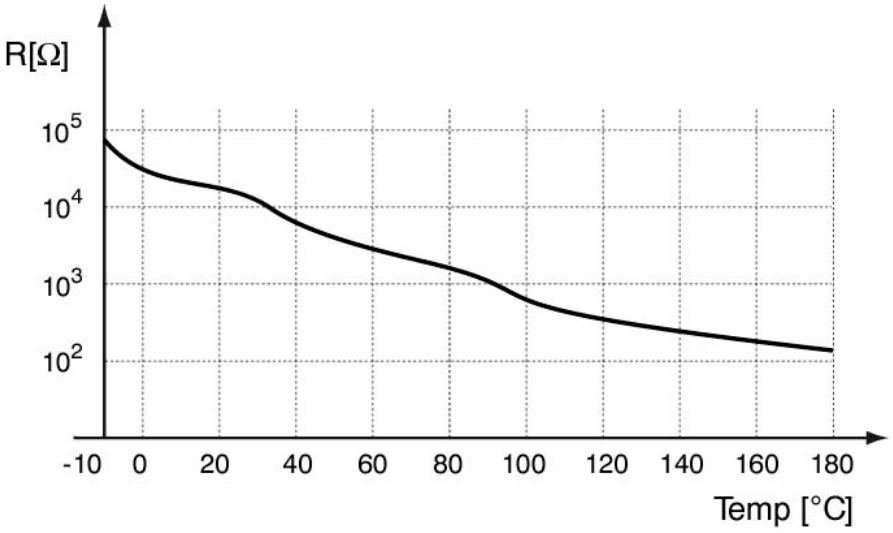
Conditions for use	
Temperature range	-30 … 200°C
Vibration	80 g/5 … 500 Hz

Characteristic
NTC 15 kΩ

Electronic data	
Nominal resistance	15 kΩ/25°C
Measuring range	0 … 200°C
Accuracy	± 1,0 K
Response time 90 %	< 10 s

Order numbers	
KPSE 6E8-33P-DN	**B 261 209 167**
Offer drawing	**A 261 209 167**
KPSE 6E8-3AP-DN	**B 261 209 173**
Offer drawing	**A 261 209 173**
AS 6-06-05PN-HE	**B 261 209 384**
Offer drawing	**A 261 209 384**
Without connector	**B 261 209 176**
Offer drawing	**A 261 209 176**





°C	R(Ω)
-10	83317,5
0	49254,0
10	29959,5
20	18732,0
30	12012,0
40	7893,0
50	5356,5
60	6651,0
70	2544,0
80	1804,5

°C	R(Ω)
90	1305,5
100	945,0
110	703,5
120	526,5
130	400,5
140	309,0
150	240,0
160	187,5
170	148,5
180	120,0

Temperature Sensor NTC M8-F

Temperature range: 0 … 200°C

The NTC M8-F is a development based on the NTC M8. It is created for very fast response air temperature measurement.

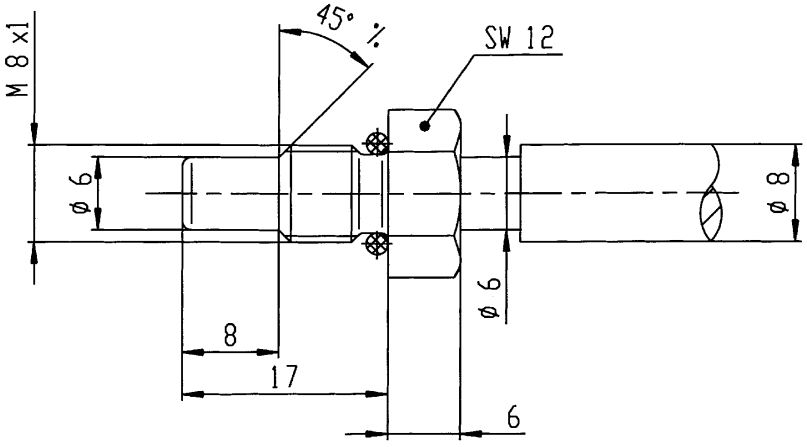
Mechanical data	
Thread	M8 x 1
Tightening torque	3 Nm
Wrench size	12 mm
Sealing	Viton 7,65 x 1, 63
Weight	45 g

Electronic data	
Nominal resistance	6,8 kΩ/25°C
Measuring range	0 … 100°C
Accuracy	± 1,0 K
Response time 90 %	< 5 s

Conditions for use	
Temperature range	-30 … 100°C
Vibration	80 g/5 … 500 Hz

Order number	
AS 6-06-05PN-HE	**B 261 209 818**

Characteristic
NTC 6,8 kΩ



Temperature Sensor NTC M12

Temperature range: -30 … 130°C

A shockproof sensor for measurements under pressure up to 25 bar. Good thermal conductivity allows fast response temperature measurement. The integrated connector provides a low-cost connection for automotive applications.

General fields of application: oil-, fuel-, water temperature measurement.

Mechanical data	
Thread	M12 x 1,5
Tightening torque	25 Nm
Wrench size	19 mm
Weight	30 g

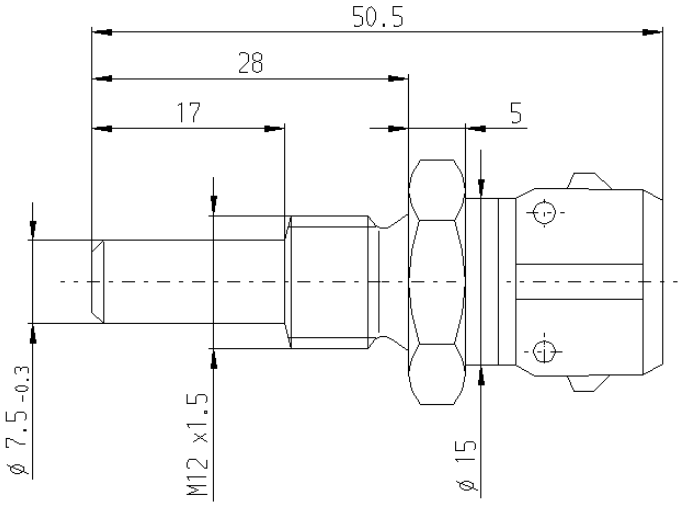
Electronic data	
Nominal resistance	2,5 kΩ/20°C
Measuring range	-30 ... 130°C
Accuracy	± 1,5 K
Response time 90 %	< 10 s

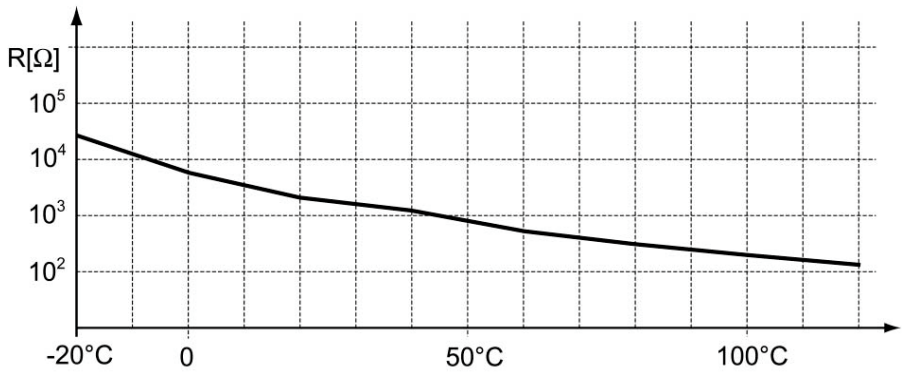
Conditions for use	
Temperature range	-30 … 130°C
Vibration	60 g/5 ... 250 Hz

Connector	
Cable harness connector	1 284 485 198

Chatacteristic
NTC 2,5 kΩ

Order numbers	
1 284 485 198	**O 280 130 026**
KPSE 6E8-33P-DN	**B 261 209 160**
Offer drawing	**A 261 209 160**





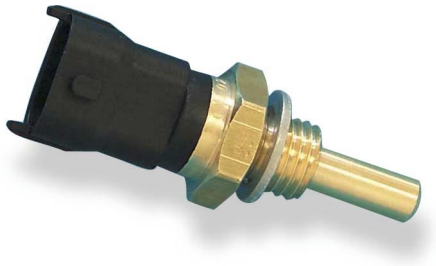
°C	R(Ω)
-40	45 313
-35	34 281
-30	26 114
-25	20 003
-20	15 462
-15	12 002
-10	9 397
-5	7 415
0	5 896
5	4 712
10	3 792
15	3 069
20	2 500
25	2 057
30	1 707
35	1 412
40	1 175
45	987,6
50	833,9
55	702,8
60	595,5

°C	R(Ω)
65	508,3
70	435,7
75	374,2
80	322,5
85	279,6
90	243,2
95	212,7
100	186,6
105	163,8
110	144,2
115	127,3
120	112,7
125	100,2
130	89,30
135	79,65
140	71,20
145	63,86
150	57,41
155	51,82
160	46,88

Temperature Sensor NTC M12-H

Temperature range: -40 … 150°C

A shockproof sensor for measurements under pressure up to 25 bar. Good thermal conductivity allows fast response temperature measurement. The integrated connector provides a low-cost connection for automotive applications.



General fields of application: oil-, fuel-, water temperature measurement.

Mechanical data	
Thread	M12 x 1,5
Tightening torque	18 Nm
Wrench size	19 mm
Weight	30 g

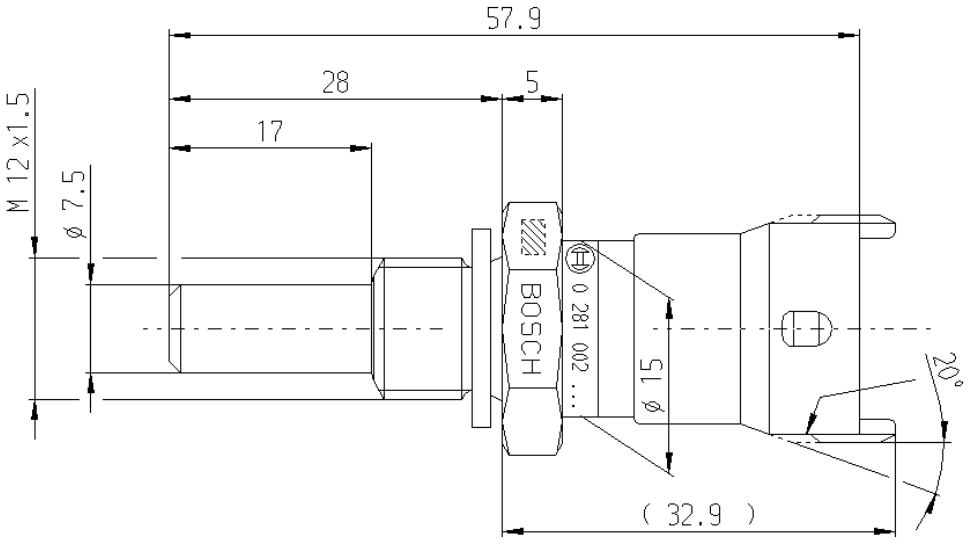
Electronic data	
Nominal resistance	2,5 kΩ/20°C
Measuring range	-40 … +150°C
Accuracy	± 1,5 K
Response time 90 %	< 10 s

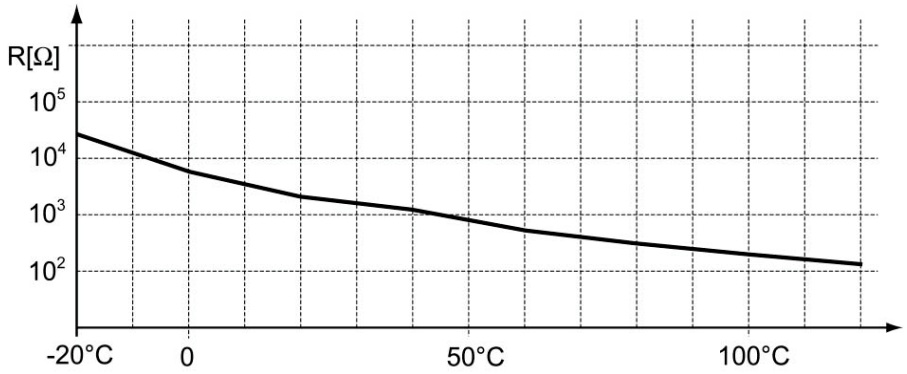
Conditions for use	
Temperature range	-40 … 150°C
Vibration	30 g/5 … 250 Hz

Connector	
Cable harness connector	1 928 403 137

Characteristic
NTC 2,5 kΩ

Order number	
	0 281 002 170
Offer drawing	**A 280 130 110**





°C	R(Ω)
-40	45 313
-35	34 281
-30	26 114
-25	20 003
-20	15 462
-15	12 002
-10	9 397
-5	7 415
0	5 896
5	4 712
10	3 792
15	3 069
20	2 500
25	2 057
30	1 707
35	1 412
40	1 175
45	987,6
50	833,9
55	702,8
60	595,5

°C	R(Ω)
65	508,3
70	435,7
75	374,2
80	322,5
85	279,6
90	243,2
95	212,7
100	186,6
105	163,8
110	144,2
115	127,3
120	112,7
125	100,2
130	89,30
135	79,65
140	71,20
145	63,86
150	57,41
155	51,82
160	46,88

Temperature Sensor NTC M12-L

Temperature range: -30 … 130°C

A shockproof sensor for measurements under pressure up to 25 bar. Good thermal conductivity allows fast response temperature measurement. The integrated connector provides a low-cost connection for automotive applications.

General fields of application: oil-, fuel-, air temperature measurement

Mechanical data	
Thread	M12 x 1,5
Tightening torque	15 Nm
Wrench size	19 mm
Weight	26 g

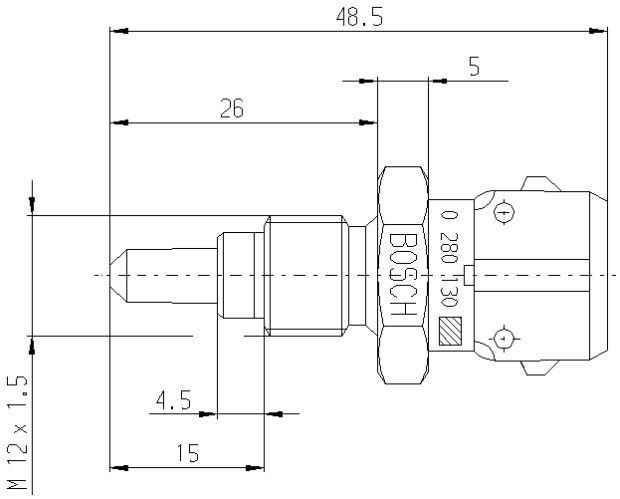
Electronic data	
Nominal resistance	2,5 kΩ/20°C
Measuring range	-30 … 130°C
Accuracy	± 1,5 K
Response time 90 %	< 10 s

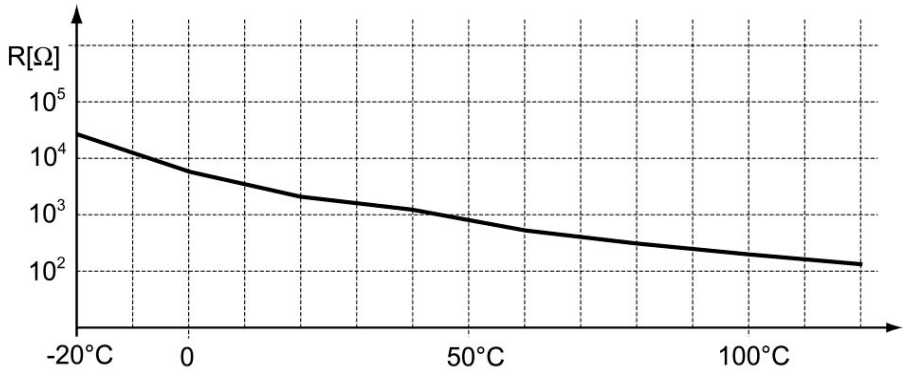
Conditions for use	
Temperature range	-30 … 130°C
Vibration	60 g/50 … 250 Hz

Connector	
Cable harness connector	1 284 485 143

Characteristic
NTC 2,5 kΩ

Order number	
	O 280 130 039
Offer drawing	**A 280 130 206**





°C	R(Ω)
-40	45 313
-35	34 281
-30	26 114
-25	20 003
-20	15 462
-15	12 002
-10	9 397
-5	7 415
0	5 896
5	4 712
10	3 792
15	3 069
20	2 500
25	2 057
30	1 707
35	1 412
40	1 175
45	987,6
50	833,9
55	702,8
60	595,5

°C	R(Ω)
65	508,3
70	435,7
75	374,2
80	322,5
85	279,6
90	243,2
95	212,7
100	186,6
105	163,8
110	144,2
115	127,3
120	112,7
125	100,2
130	89,30
135	79,65
140	71,20
145	63,86
150	57,41
155	51,82
160	46,88

Temperature Sensor PT100 M14

Temperature range: -50 … 300°C

A shockproof sensor for measurements under pressure up to 25 bar. Good thermal conductivity allows fast response temperature measurement. The integrated connector provides a low cost connection for automotive applications.

Mechanical data	
Thread	M14 x 1,5
Tightening torque	15 Nm
Wrench size	19 mm
Weight	25 g

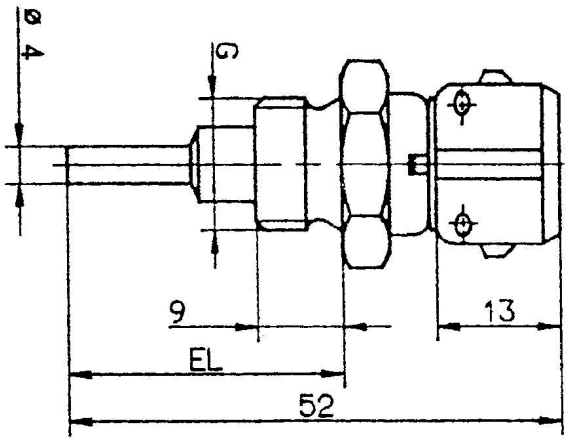
Electronic data	
Nominal resistance	100 Ω/0°C
Measuring range	-50 … 300°C
Accuracy	± 3,0 K
Response time 90 %	< 10 s

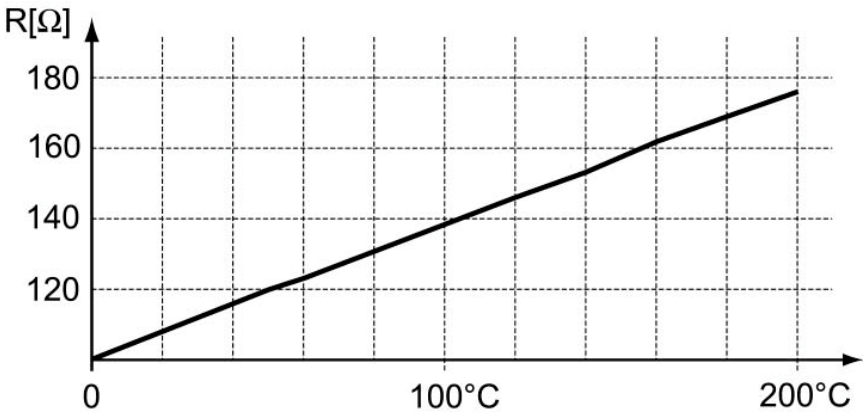
Conditions for use	
Temperature range	-50 … 300°C
Vibration	40 g/5Hz ... 2kHz

Connector	
Cable harness connector	1 284 485 143

Characteristic
PT 100 DIN/IEC 751

Order number	
	B 261 209 174
Offer drawing	**A 261 209 174**





°C	R(Ω)
0	100,00
10	103,90
20	107,79
30	111,67
40	115,54
50	119,40
60	123,24
70	127,07
80	130,89
90	134,70
100	138,50

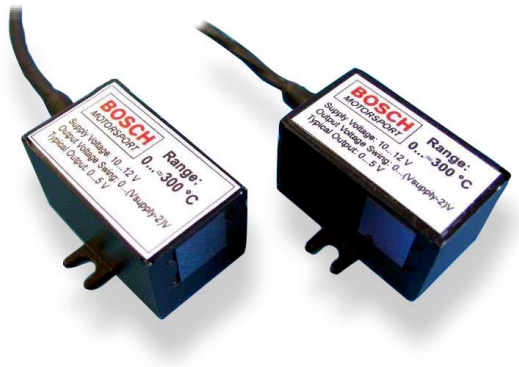
°C	R(Ω)
110	142,29
120	146,06
130	149,82
140	153,58
150	157,31
160	161,04
170	164,76
180	168,46
190	172,16
200	175,84

Temperature Sensors Infrared

Temperature Sensor TI 300

Temperature range: up to 300°C

This measurement system is used for the non-contact measurement of surface temperatures e.g. of tyres or brake discs based on IR-radiation. The sensor is integrated in an ambient temperature compensated module with mirror optics and additional IR-window in protection against contamination and condensation. Various connector options are available.

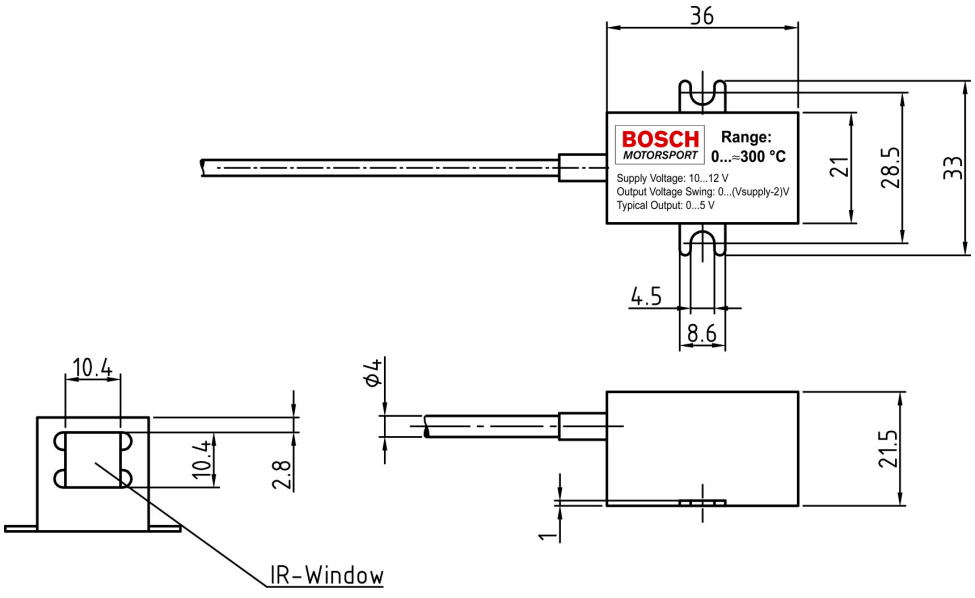


Mechanical data	
Dimensions	20 x 21 x 36 mm
Length L	100 … 1500 mm
Weight	51 g

Electronic data	
Power supply	10 … 12 V
Input current	2,5 mA
Output voltage swing	0 … (Vsupply –2) V
Typical output	0 … 5 V
Response time	20 ms

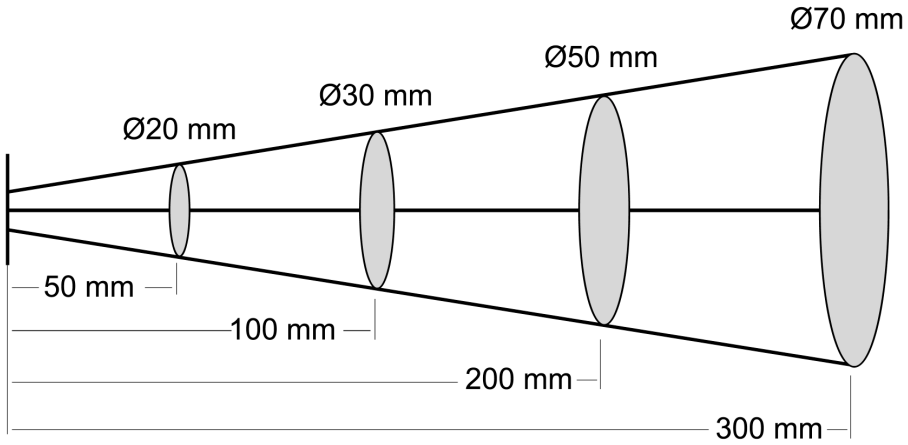
Conditions for use	
Temperature range	-20 … 300°C
Field of view	± 3°

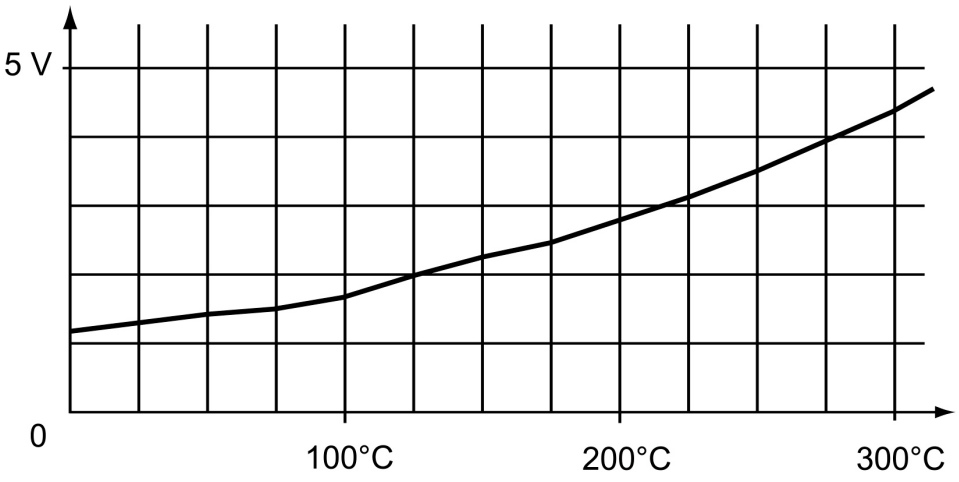
Order numbers	
Front view:	
AS 6-06-05PN-HE	**B 261 209 388**
Offer drawing	**A 261 209 388**
Right view:	
AS 6-06-05PN-HE	**B 261 209 389**
Offer drawing	**A 261 209 389**



Working area

Spot size of the sensor for 90 % of irradiance from field view:





Tobject°C	Vout
-20	1,176
0	1,232
20	1,303
25	1,323
40	1,390
60	1,497
80	1,622
100	1,768
120	1,935

Tobject°C	Vout
140	2,123
160	2,332
180	2,562
200	2,813
220	3,085
240	3,377
260	3,689
280	4,021
300	4,371

Temperature Sensor TI 1000

Temperature range: up to 1000°C

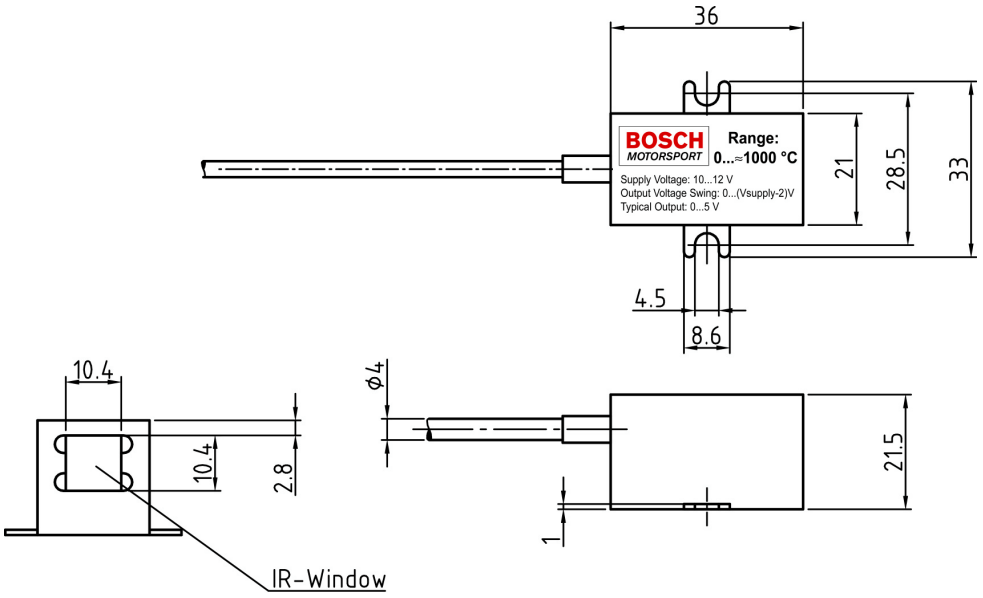
This measurement system is used for the non-contact measurement of surface temperatures e.g. of tyres or brake discs based on IR-radiation. The sensor is integrated in an ambient temperature compensated module with mirror optics and additional IR-window in protection against contamination and condensation. Various connector options are available.

Mechanical data	
Dimensions	20 x 21 x 36 mm
Length L	100 … 1500 mm
Weight	51 g

Electronic data	
Power supply	10 … 12 V
Input current	2,5 mA
Output voltage swing	0 … (Vsupply –2) V
Typical output	0 … 5 V
Response time	20 ms

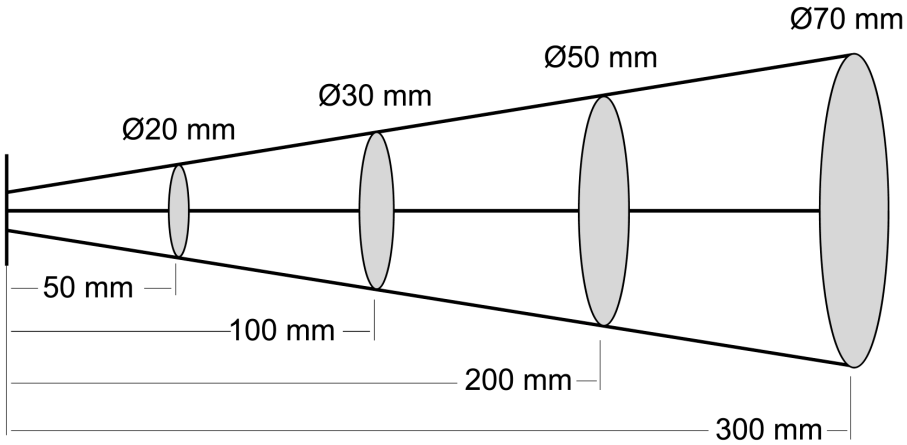
Conditions for use	
Temperature range	-20 … 1000°C
Field of view	± 3°

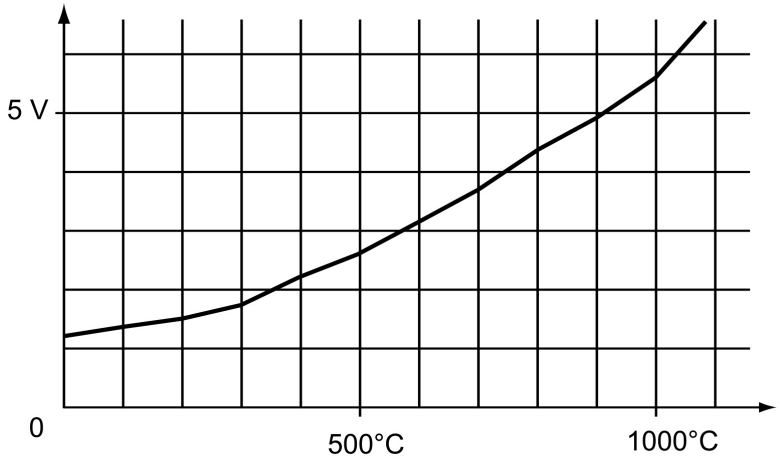
Order numbers	
Front view:	
AS 6-06-05PN-HE	**B 261 209 390**
Offer drawing	**A 261 209 390**
Right view:	
AS 6-06-05PN-HE	**B 261 209 391**
Offer drawing	**A 261 209 391**



Working area

Spot size of the sensor for 90% of irradiance from field view





Tobject °C	Vout
-20	1,216
0	1,227
20	1,240
25	1,244
40	1,257
60	1,277
80	1,301
100	1,328
120	1,360
140	1,395
160	1,435
180	1,478
200	1,526
220	1,577
240	1,632
260	1,691

Tobject °C	Vout
280	1,754
300	1,820
350	2,000
400	2,200
450	2,418
500	2,652
550	2,901
600	3,163
650	3,437
700	3,722
750	4,017
800	4,321
850	4,633
900	4,952
950	5,278
1000	5,610

Thermocouple Probes

Thermocouple Probe TCP-K

Temperature range: 32 … 1300°C

A flexible K-type thermocouple for measuring exhaust-gas temperatures. The installation fitting allows an adjustable gas-tight mounting at the exhaust pipe. It is manufactured in a DR-25 sleeve, various connector options are available. The sensor length can be modified on request.

Mechanical data	
Thread	M8 x 1
Tightening torque	12 Nm
Wrench size	13 mm
Weight	18 g

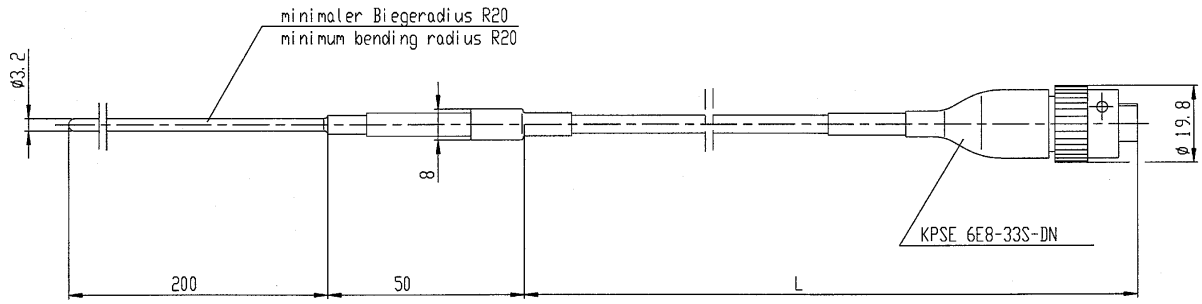
Cutting ring	
Tightening torque	2,5 Nm
Wrench size	11 mm

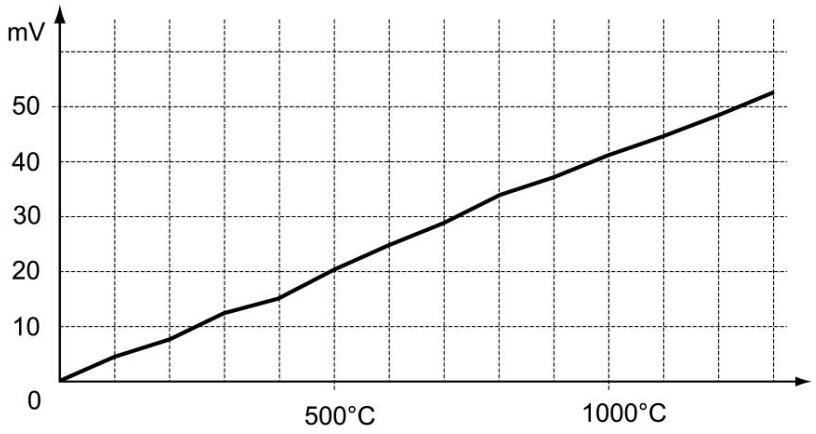
Electronic data	
Thermocouple	NiCr-Ni

Characteristic
DIN IEC 584

Sensor data	
Vibration	80 g/5 … 500 Hz
Length L	150 … 740 mm
Weight	60 g

Order numbers	
KPTA 6E6-4SW-C-DN	**B 261 209 169**
Offer drawing	**A 261 209 169**
AS 6-06-98PN	**B 261 209 179**
Offer drawing	**A 261 209 179**
AS 6-06-05PD-HE	**B 261 209 385**
Offer drawing	**A 261 209 385**
Installation fitting	**B 261 209 159**
Offer drawing	**A 261 209 159**





Input °C	Output mV
0	0
100	4,095
200	8,137
300	12,207
400	16,395
500	20,640
600	24,902

Input °C	Output mV
700	29,128
800	33,277
900	37,325
1000	41,269
1100	45,108
1200	48,828
1300	52,398

Thermocouple Probe TCP-N

Temperature range: -40 … 1000°C

A flexible N-type thermocouple for measuring exhaust-gas temperatures.

Mechanical data	
Thread	M12 x 1
Tightening torque	15 Nm
Wrench size	17 mm

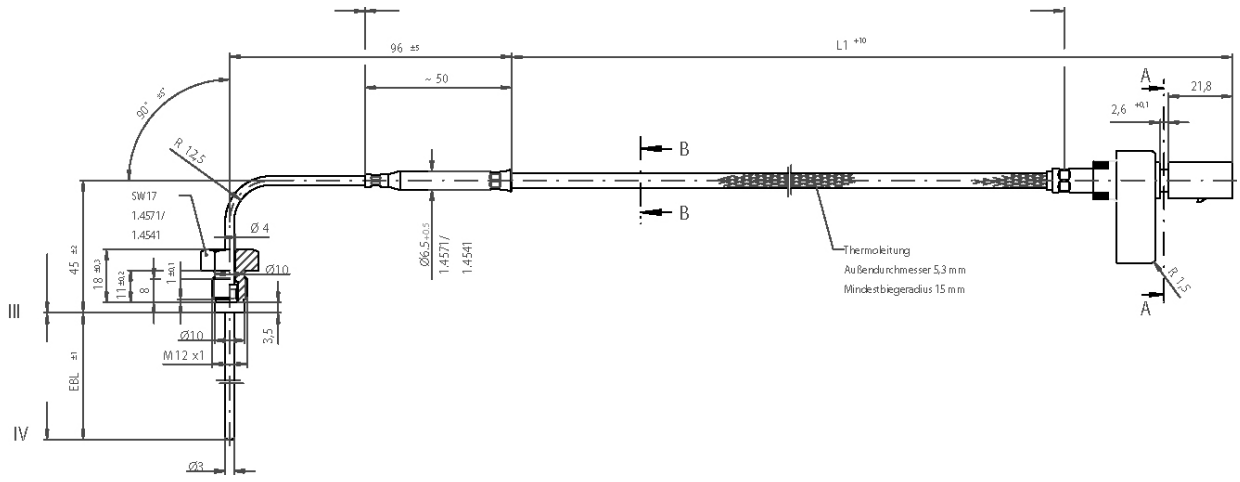
Conditions for use	
Vibration	80 g/5 … 500 Hz

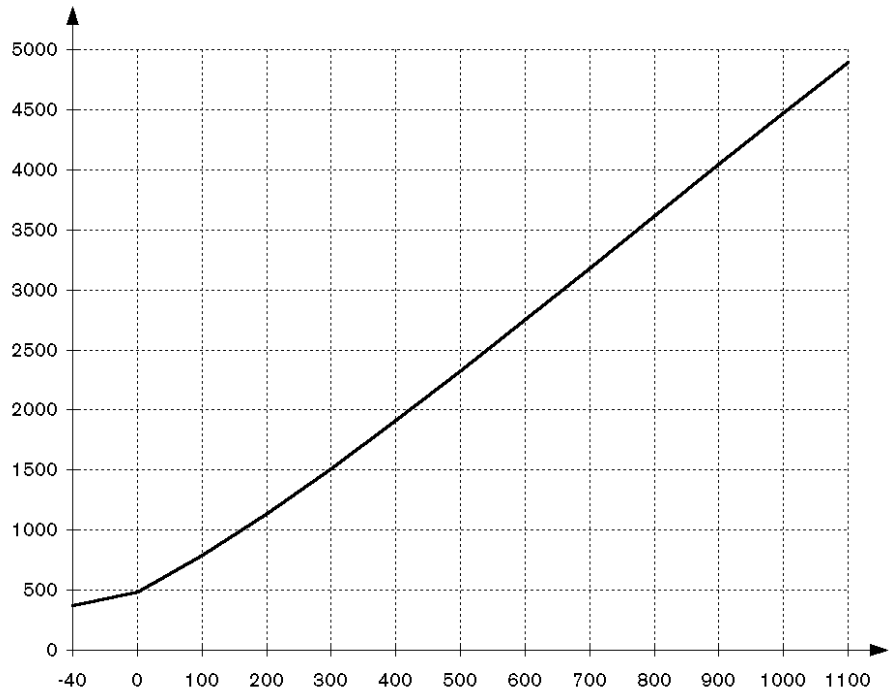
Characteristic
DIN EN 60584

Electronic data	
Power supply	12 V
Full scale output	0,5 … 4,5 V
Thermocouple	NiCrSi-NiSi
Measuring range	40 … 1000°C

Sensor data	
Length	630 mm
Weight	60 g

Order number	
1-J0973-70	**B 261 209 387**
Offer drawing	**A 261 209 387**





Input °C	Output mV
-40	372
0	485
100	790
200	1135
300	1513
400	1912
500	2327

Input °C	Output mV
600	2752
700	3183
800	3615
900	4046
1000	4473
1100	4845

Speed Sensors Inductive

Inductive Speed Sensor IA

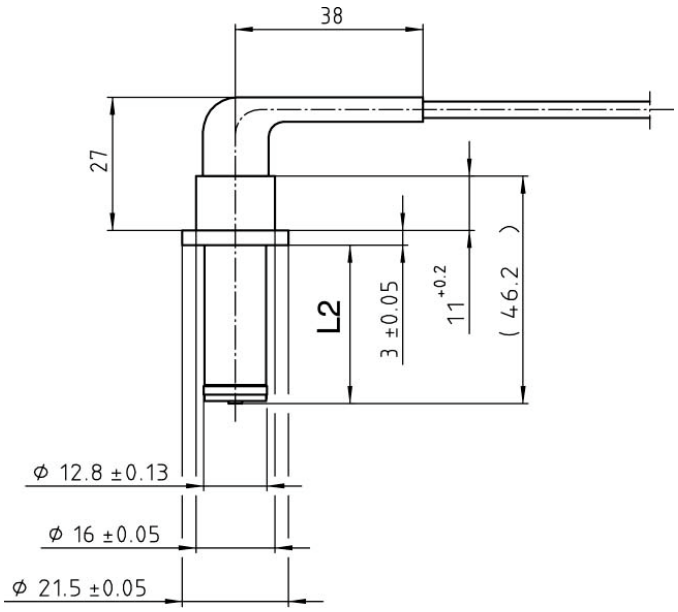
This sensor is designed for incremental measurement of revolutions and angles at engine and chassis applications. It is available in a DR-25 sleeve with various connector options and different installation depths.

Mechanical data	
Magnetic pole	round
Drill diameter	12,9 mm
Tightening torque	8 Nm
Weight	70 g
Installation depth L2	13,2/24,1/32,2/41,5 mm

Conditions for use	
Temperature range	-40 … 230°C
Vibration	80 g/max. 80 h

Electronic data	
Electrical strength	1200 V/max. 3 sec.
Resistance	Ri = 1200 Ω
Inductance	max. 400 mH

Order numbers	
L2: 24, 1 mm	
KPTA 6E6-4SW-C-DN	**B 261 209 500**
Offer drawing	**A 261 209 500**
KPSE 6E8-3AS-DN	**B 261 209 023**
Offer drawing	**A 261 209 023**
L2: 32,2 mm	
AS 6-06-05SN-HE	**B 261 209 519**
Offer drawing	**A 261 209 519**
KPSE 6E8-3AS-DN	**B 261 209 022**
Offer drawing	**A 261 209 022**



Inductive Speed Sensor IA-C

This sensor is designed for incremental measurement of revolutions at engine applications.

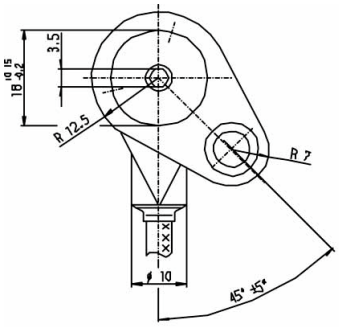
Mechanical data	
Magnetic pole	round
Fixing	M6 x 12
Length	510 mm
Tightening torque	8 Nm
Weight	80 g
Installation depth	24 mm

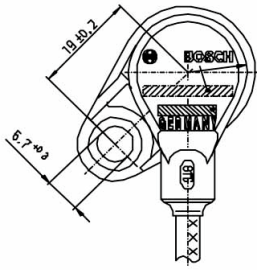
Electronic data	
Resistance	860 Ω/20° ± 10 %
Inductance	370 ± 60 mH/1 kHz

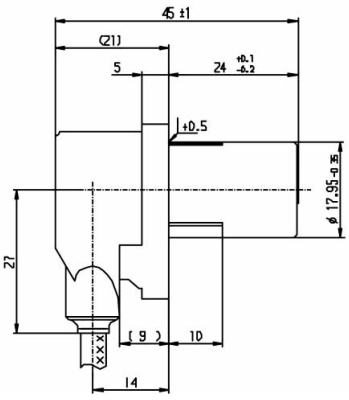
Connector	
Cable harness connector	**1 928 402 868**

Conditions for use	
Temperature range	-40 … 130°C
Vibration	80 g/max. 80 h

Order number	
	0 261 210 136
Offer drawing	**A 265 461 845**







Inductive Speed Sensor IS

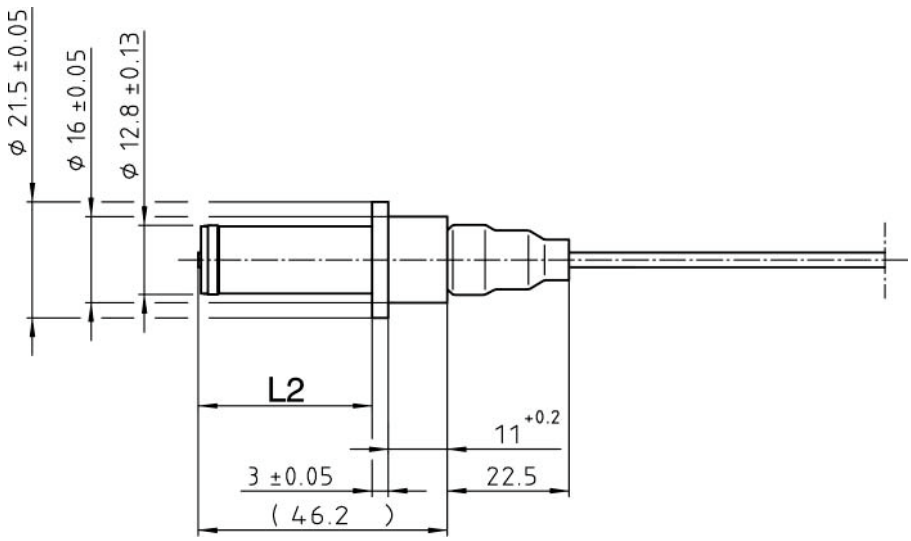
This sensor is designed for incremental measurements of revolutions and angles at engine and chassis applications. It is available in a DR-25 sleeve with various connector options and different installation depths.

Mechanical data	
Magnetic pole	round
Drill hole	12,9 mm
Tightening torque	8 Nm
Weight	70 g
Installation depth L2	13,2/24,1/32,2 mm

Conditions for use	
Temperature range	-40 … 230°C
Vibration	80 g/max. 80 h

Electronic data	
Electrical strength	1200 V/max. 3 sec.
Resistance	Ri = 1200 Ω
Inductance	max. 400 mH

Order numbers	
L2: 24,1 mm	
KPTA 6E6-4SW-C-DN	**B 261 209 509**
Offer drawing	**A 261 209 509**
L2: 32,2 mm	
AS6-06-05SN-HE	**B 261 209 517**
Offer drawing	**A 261 209 517**
KPTA 6E6-4SW-C-DN	**B 261 209 501**
Offer drawing	**A 261 209 501**
KPSE 6E8-3AS-DN	**B 261 209 021**
Offer drawing	**A 261 209 021**



Inductive Speed Sensor IS-C

This sensor is designed for incremental measurement of revolutions at chassis applications. We manufacture one version with a metric thread and a second version with an inch thread. The sensor is available in a DR-25 sleeve with various connector options.

Mechanical data	
Magnetic pole	round
Drill hole or	M10 x 1 3/8-24 UNF-2A THD
Mounting torque	10 Nm (7.3 ft-lb) maximum
Weight	16 g

Conditions for use	
Temperature range	-40 … 150°C

Electronic data	
Resistance	Ri = 340 Ω ± 20 %
Inductance	64 mH ± 20 %

Order numbers	
AS 6-06-05 SN-HE	
M10 x 1	**B 261 209 617**
3/8-24 UNF-2A THD	**B 261 209 609**

Inductive Speed Sensor IS-T

This sensor is designed for incremental measurements of revolutions at turbo-chargers. It is available in a DR-25 sleeve with various connector options.

Mechanical data	
Magnetic pole	round
Fixing	not defined
Drill diameter	250-40UNS-2ATHD
Length	150 … 600 mm
Wrench size	8 mm
Tightening torque	1,4 Nm
Weight	14 g
Air gap	0,5 mm, 2 kΩ load, 0,75 V pk-pk

Conditions for use	
Temperature range	-54 … 230°C

Electronic data	
Resistance	140 … 190 Ω
Inductivity	2,6 mH (typical)

Order number	
AS 6-06-05SN-HE	**B 261 209 662**
Offer drawing	**A 261 209 662**

Speed Sensors
Hall-effect / magnetoresistive

Speed Sensor HA

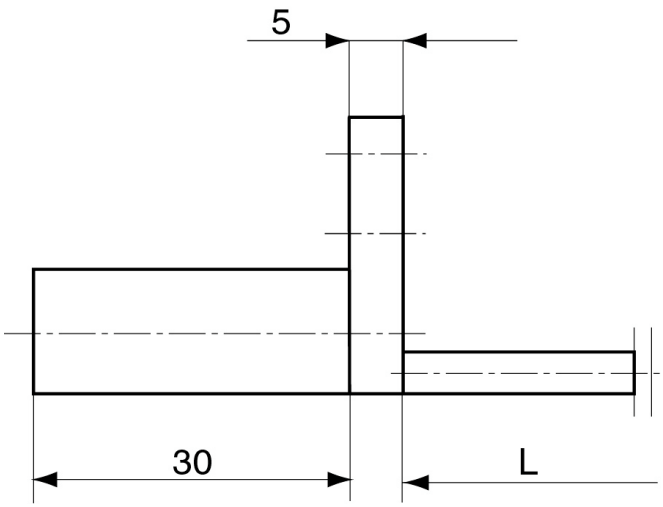
This sensor is designed for incremental measurement of revolutions and angles at engine and chassis applications. It is available in a DR-25 sleeve with various connector options.

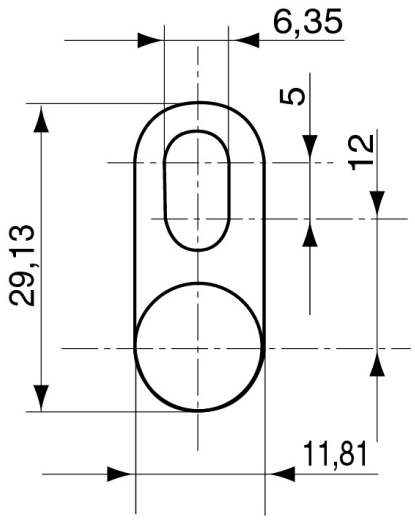
Mechanical data	
Fixing	M6
Drill hole	11,8 mm
Max. distance	1,52 mm
Tightening torque	6 Nm
Weight	70 g

Electronic data	
Power supply	4,5 … 24 V
Input current	10 mA typ., 20 mA max.
Signal output (active)	0,4 V max.
Output current	20 mA max.

Conditions for use	
Temperature range	-40 … 150°C
Vibration	100 g/10 Hz … 2 kHz

Order numbers	
KPTC 6E8-3P-C-DN	**B 261 209 046**
Offer drawing	**A 261 209 046**
KPTA 6E6-4P-C-DN	**B 261 209 552**
Offer drawing	**A 261 209 552**





Speed Sensor HA-P

This sensor is designed for incremental measurement of revolutions and angles at engine and chassis applications.

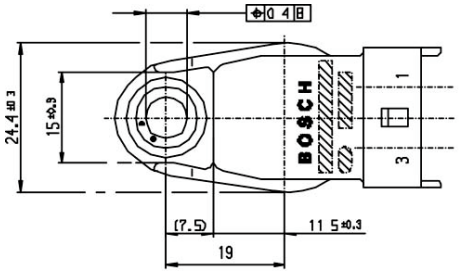
Mechanical data	
Fixing	M6
Drill hole	18 mm
Max. distance	1,52 mm
Tightening torque	6 Nm
Weight	70 g
Installation dimensions	30 mm

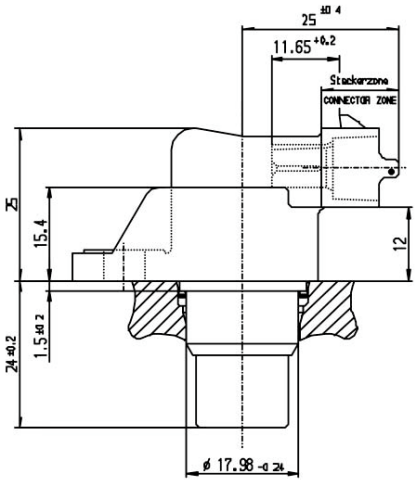
Conditions for use	
Temperature range	-30 … 130°C
Vibration	100 g/10 Hz … 2 kHz
Air gap	max. 1,5 mm

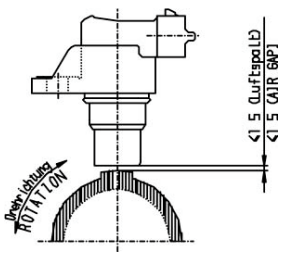
Electronic data	
Power supply	4,5 … 24 V
Input current	10 mA typ., 20 mA max.
Signal output (active)	0,4 V max.
Output current	20 mA max.

Connector	
Cable harness connector	**1 928 403 110**

Order number	
	0 232 103 022
Offer drawing	**A 232 090 314**







Speed Sensor MA-A/B/C/D

This sensor is designed for incremental measurement of revolutions and angles at engine and chassis applications. It is available in a DR-25 sleeve with various connector options.

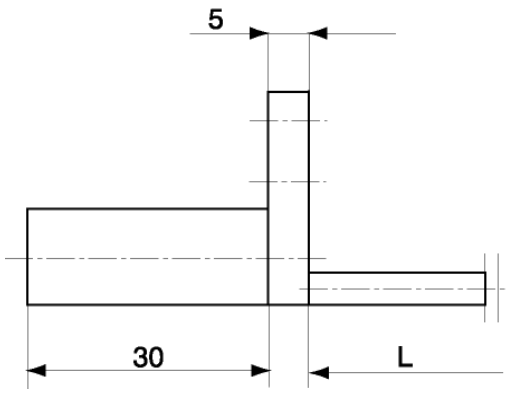
Mechanical data	
Fixing	M6
Drill hole	11,8 mm
Max. distance	1,2 mm
Tightening torque	6 Nm
Weight	12 g

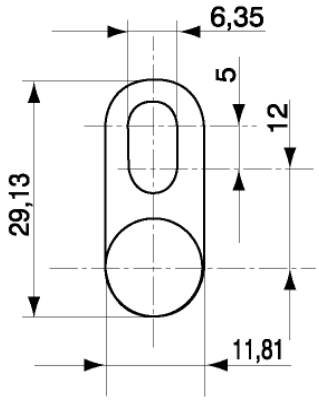
Conditions for use	
Temperature range	-40 … 120°C
Vibration	300 g/200 … 500 Hz

Please notice
Stray magnetic fields have an influence on the switching behaviour of the sensor element.
Direction of squarewave depends both on design and mounting position of the sensor.

Electronic data	
Power supply	5 … 10 V
Input current	7,5 mA
Signal output high level	> 4,25 V
Signal output low level	< 0,2 V

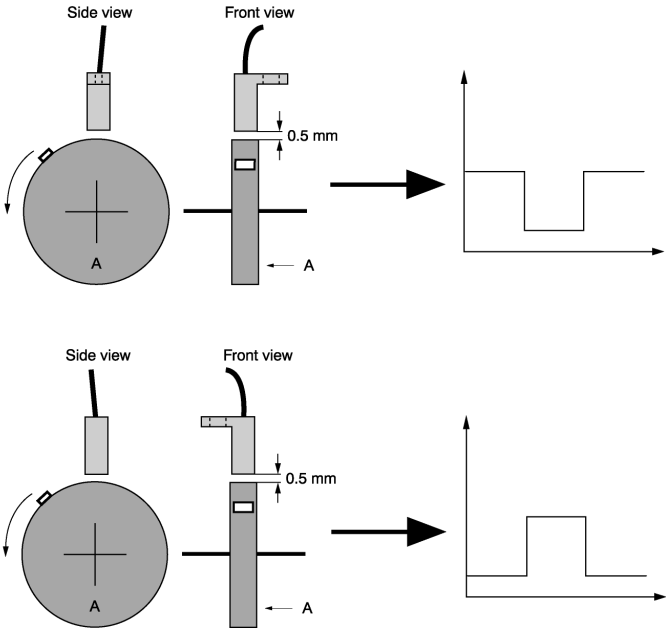
Order numbers	
MA-A	
AS-6-06-05PC-HE high active	**B 261 209 556**
Offer drawing	**A 261 209 556**
KPTA 6E6 4P-C-DN high active	**B 261 209 680**
Offer drawing	**A 261 209 680**
MA-B	
AS-6-06-05PC-HE low active	**B 261 209 559**
Offer drawing	**A 261 209 559**
MA-C	
AS-6-06-05PC-HE high active	**B 261 209 681**
Offer drawing	**A 261 209 681**
MA-D	
AS-6-06-05PC-HE high active	**B 261 209 682**
Offer drawing	**A 261 209 682**



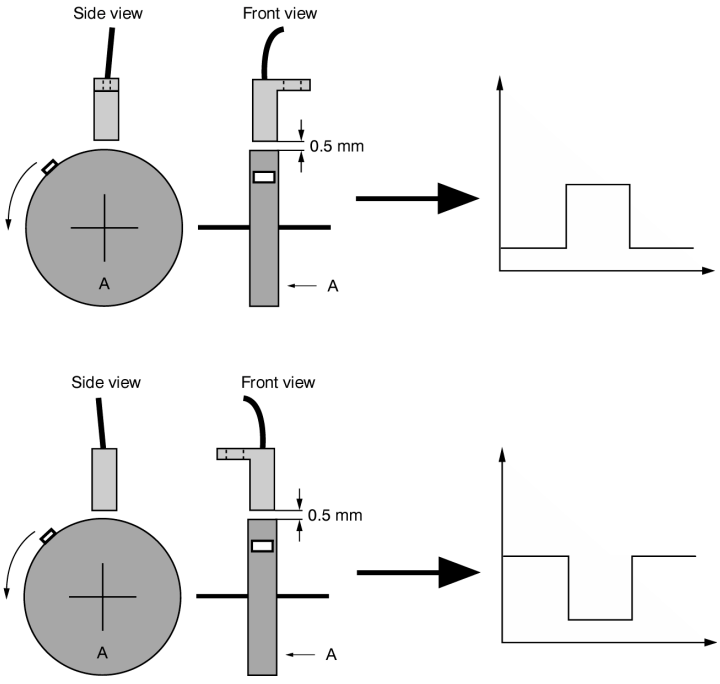


Influence of mounting position on signal shape

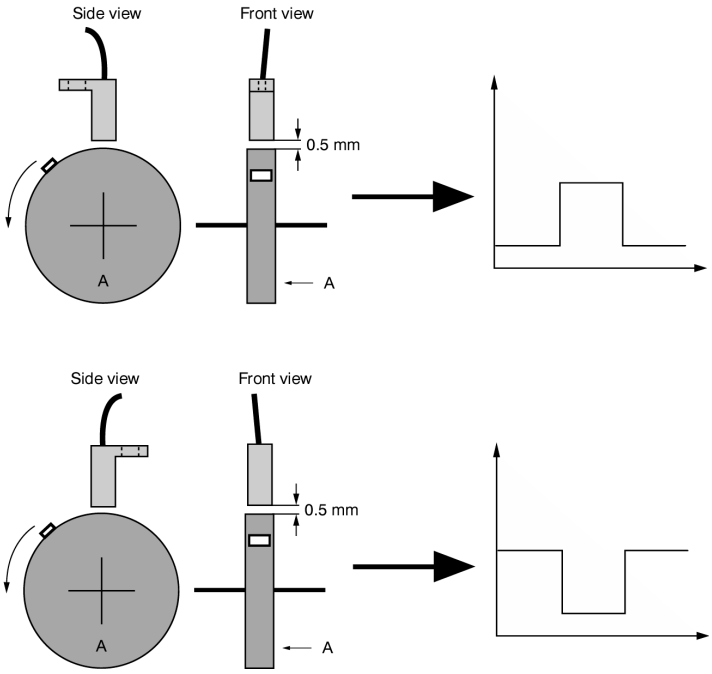
Speed sensor MA-A



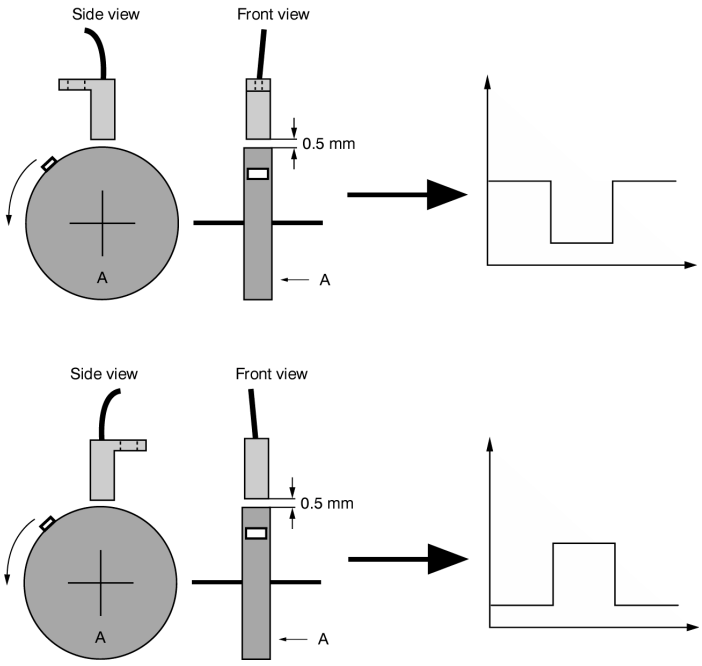
Speed sensor MA-B



Speed sensor MA-C



Speed sensor MA-D



Lambda Sensors

Lambda Sensor LSM 11

A lambda LSM 11 standard production sensor, manufactured in a DR-25 sleeve with a series connector.

Mechanical data	
Length	250 … 1390 mm
Thread	M18 x 1,5
Tightening torque	60 Nm
Wrench size	22 mm
Weight	160 g
Vibration	30 g/5 Hz … 2 kHz

Fuel additives	
Sulphur (weight)	0,2 %
Lead	0,6 g/l

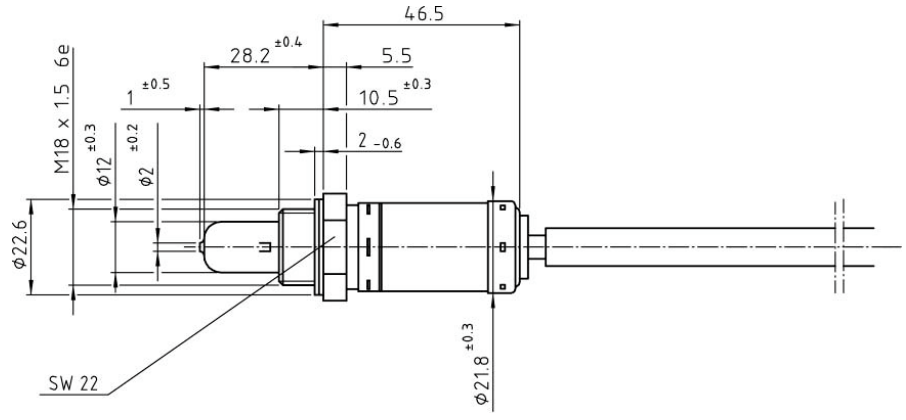
Temperature ranges	
Ceramic tip	250 …850°C
Hexagon nut	< 570°C
Cable duct	< 250°C
Connector	< 130°C

Electronic data	
Heater supply voltage	12 … 14 V
Heater power	18 W
Sensor element	ZrO_2 (Zirconium-Oxide-Ceramic)
Lambda measuring range	0,68 … 1,32
Accuracy at lambda < 1	< 1,5 %

Connector
1 284 485 110
+ 1 224 485 018

Installation instructions
Please observe the installation instructions on page 84!

Order number	
	0 258 104 002
Offer drawing	**A 258 104 002**



Lambda Sensor LSM 11-PM

A lambda LSM 11 standard production sensor, manufactured in a DR-25 sleeve , various connector options are available.

Mechanical data	
Length	250 … 1390 mm
Thread	M18 x 1,5
Tightening torque	60 Nm
Wrench size	22 mm
Weight	160 g
Vibration	30 g/5 Hz … 2 kHz

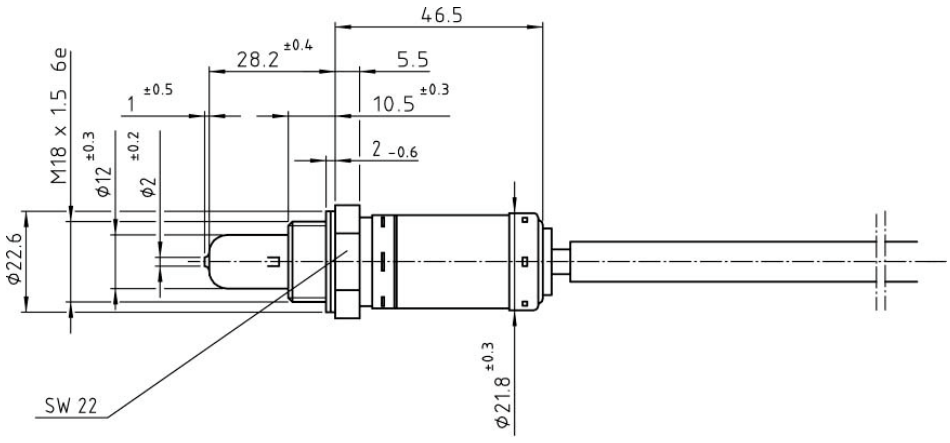
Fuel additives	
Sulphur (weight)	0,2 %
Lead	0,6 g/l

Temperature ranges	
Ceramic tip	250 … 800°C
Hexagon nut	< 570°C
Cable duct	< 250°C
Connector	< 130°C

Electronic data	
Heater supply voltage	12 … 14 V
Heater power	18 W
Sensor element	ZrO_2 (Zirconium-Oxide-Ceramic)
Lambda measuring range	0,68 … 1,32
Accuracy at lambda < 1	< 1,5 %

Installation instructions
Please observe the installation instructions on page 84!

Order number	
KPTC 6E8-4P-C-DN	**B 261 209 105**
Offer drawing	**A 261 209 105**



Lambda Sensor LSM 11-RM

An individually selected wide-band LSM 11 lambda sensor. It is specially modified for motorsport use, manufactured in a Viton sleeve. Various connector options are available.

Mechanical data	
Length	250 … 1390 mm
Thread	M18 x 1,5
Tightening torque	60 Nm
Wrench size	22 mm
Weight	160 g
Vibration	70 g/5 Hz … 2 kHz

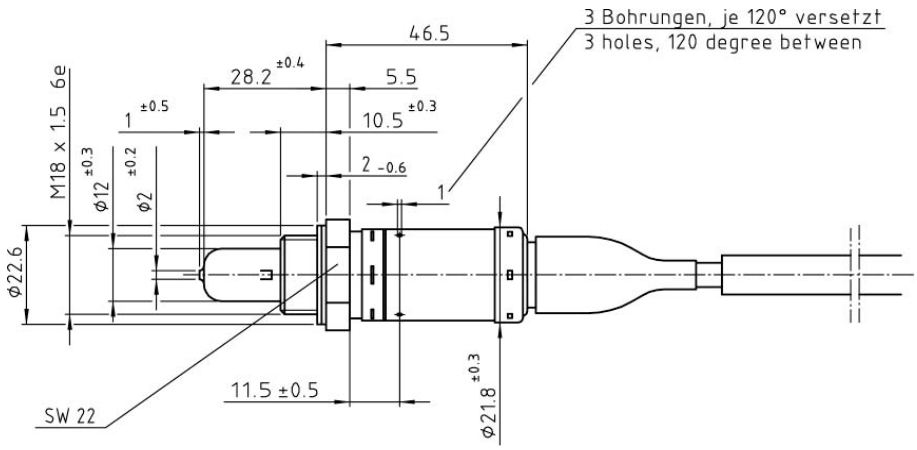
Fuel additives	
Sulphur (weight)	0,2 %
Lead	0,6 g/l

Temperature ranges	
Ceramic tip	250 … 850°C
Hexagon nut	< 570°C
Cable duct	< 250°C
Connector	< 130°C

Electronic data	
Heater supply voltage	12 … 14 V
Heater power	18 W
Sensor element	ZrO_2 (Zirconium-Oxide-Ceramic)
Lambda measuring range	0,68 … 1,32
Accuracy at lambda < 1	< 1,5 %

Installation instructions
Please observe the installation instructions on page 84!

Order number	
KPTC 6E8-4P-C-DN	**B 261 209 101**
Offer drawing	**A 261 209 101**



Lambda Sensor LSU

The wide-band lambda sensor LSU is a planar ZrO_2 dual cell limiting current sensor with integrated heater. It is used to measure the oxygen content and the lambda value of engine exhaust gases. Its output signal in the range of lambda = 0,7 to air makes the LSU capable to be used as an universal sensor for lambda = 1 measurement as well as for other lambda ranges.

The connector module carries a trimming resistor, which defines the characteristics of the sensor and is necessary for the sensor function. The wide band sensor LSU operates only in conjunction with a special control unit.

Mechanical data	
Length	460 mm/600 mm
Thread	M18 x 1,5
Tightening torque	60 Nm
Wrench size	22 mm
Weight	120 g
Vibration	30 g/5 Hz … 2 kHz

Fuel additives
In accordance with DIN EN 228 for commercially available unleaded fuel.

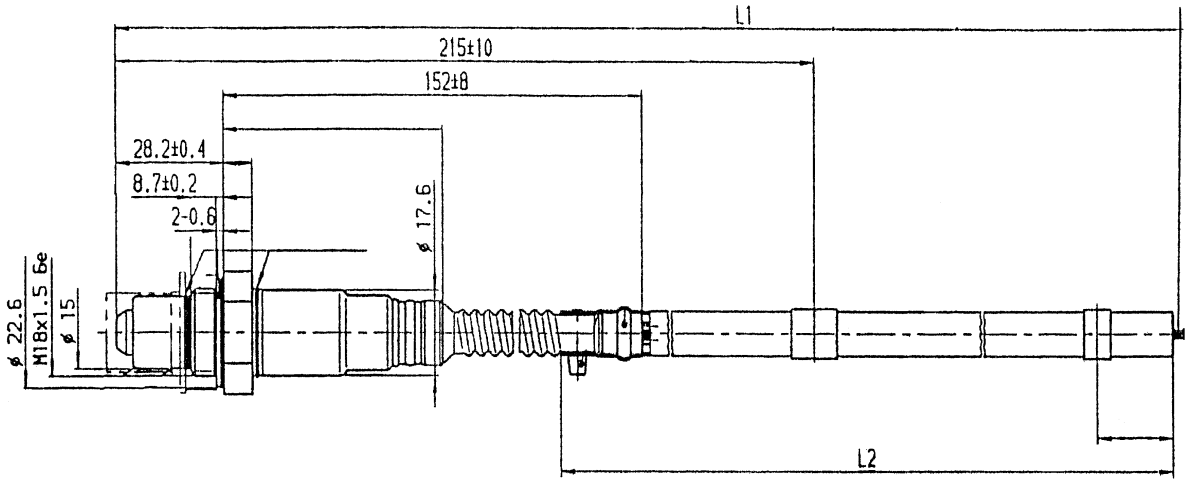
Temperature ranges	
Exhaust gas at sensor element	850°C
Hexagon of the sensor housing	< 570°C
Cable grommet (PTFE formed house)	
-Sensor side	< 250°C
-Cable side	< 200°C
Cable and protection sleeve	< 250°C
Connector	< 120°C

Electronic data	
Heater supply voltage	9 V
Heater power	10 W
Sensor element	ZrO_2 (Zirconium-Oxide-Ceramic)
Lambda measuring range	0,70 … ∞

Connector	
Cable harness connector	**D 261 205 138**

Installation instructions
Please observe the installation instructions on page 84!

Order numbers	
L: 460 mm	**0 258 006 066**
L: 600 mm	**0 258 006 065**
Offer drawing	**A 258 400 021**



Installation instructions

The Lambda sensor should be installed at a point which permits the measurement of a representative exhaust-gas mixture, and which does not exceed the maximum permissible temperature. The sensor is screwed into a mating thread and tightened with 50 … 60 Nm.

- Install at a point where the gas is as hot as possible.
- Observe the maximum permissible temperatures.
- As far as possible install the sensor vertically, whereby the electrical connections should point upwards.
- The sensor is not to be fitted near to the exhaust outlet so that the influence of the outside air can be ruled out. The exhaust-gas passage opposite the sensor must be free of leaks in order to avoid the effects of leak-air.
- Protect the sensor against condensation water.
- The sensor body must be ventilated from the outside in order to avoid overheating.
- The sensor is not to be painted, nor is wax to be applied or any other forms of treatment. Only the recommended grease is to be used for lubricating the threads.
- The sensor receives the reference air through the connection cable. This means that the connector must be clean and dry. Contact spray, and anti-corrosion agents etc. are forbidden.

The connection cable must not be soldered. It must only be crimped, clamped, or secured by screws.

Knock Sensors

Knock Sensor KS-P

This sensor is designed to measure the structure borne noise resulted from irregular engine combustion. The robust sensor is suitable for use under extreme conditions.

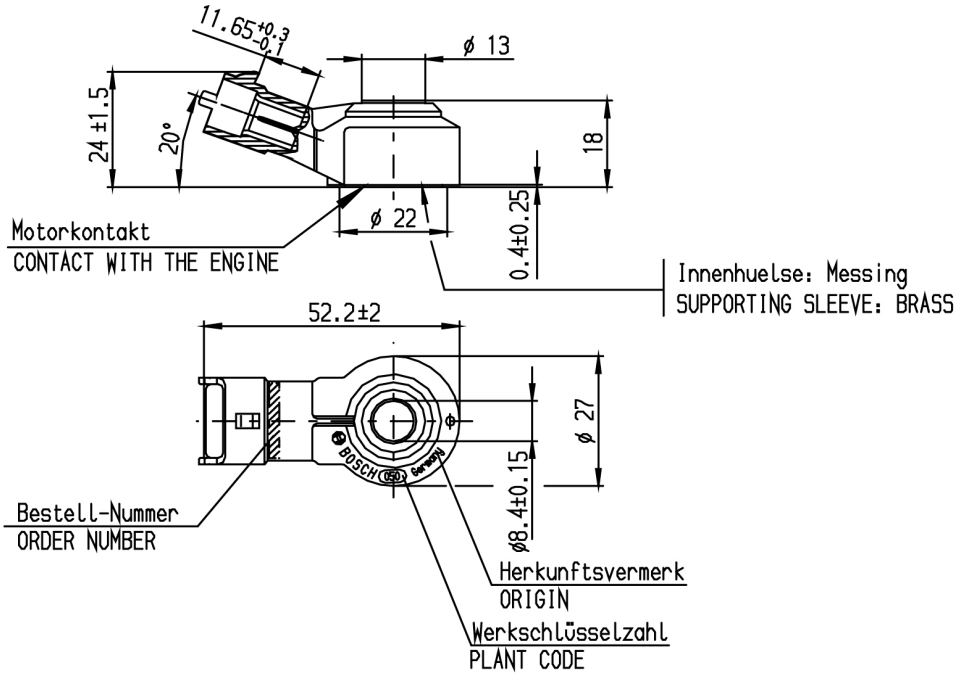
Mechanical data	
Thread	M8 x 30 (aluminium engine block) M8 x 25 (cast iron engine block)
Weight	48 g
Tightening torque	15 … 25 Nm
Mounting position	random

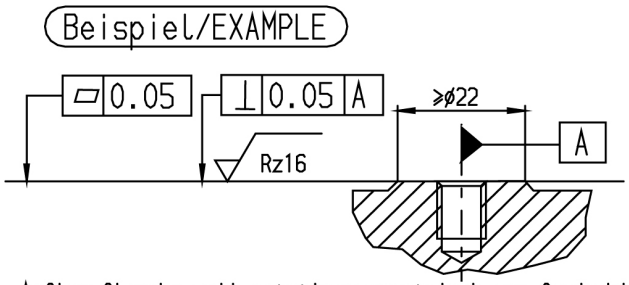
Conditions for use	
Temperature range	-40 … 150°C
Vibration, constant	≤ 80 g
Vibration, short	≤ 400 g

Connector	
Cable harness connector	**1 928 403 137**

Electronic data	
Main resonance frequency	> 20 kHz
Impedance R:	> 1MΩ
C	1100 ± 300 pF
Measuring range	0,1 … 400 g
Sensitivity at 5 kHz	26 ± 8 mV/g
Range of frequency	1 … 20 kHz

Order number	
	0 261 231 120
Offer drawing	**A 261 230 170**





Sensor darf nur auf seinen Metall-flaechen aufliegen (keine Sicherungs-scheiben verwenden)
ONLY THE METALLIC PART OF THE SENSOR MAY HAVE CONTACT WITH THE ENGINE (NO WASHERS ARE TO BE USED)

Auflageflaeche soll rotationssymmetrisch zur Gewindebohrung bearbeitet werden.
THE CONTACT SURFACE MUST BE MACHINED ROTATIONALLY SYMMETRICAL TO THE THREADED BORE.

Knock Sensor KS-R

This sensor is designed for knock detection and control. It is also available in a DR-25 sleeve with various connector options. Other sensors are available on request.

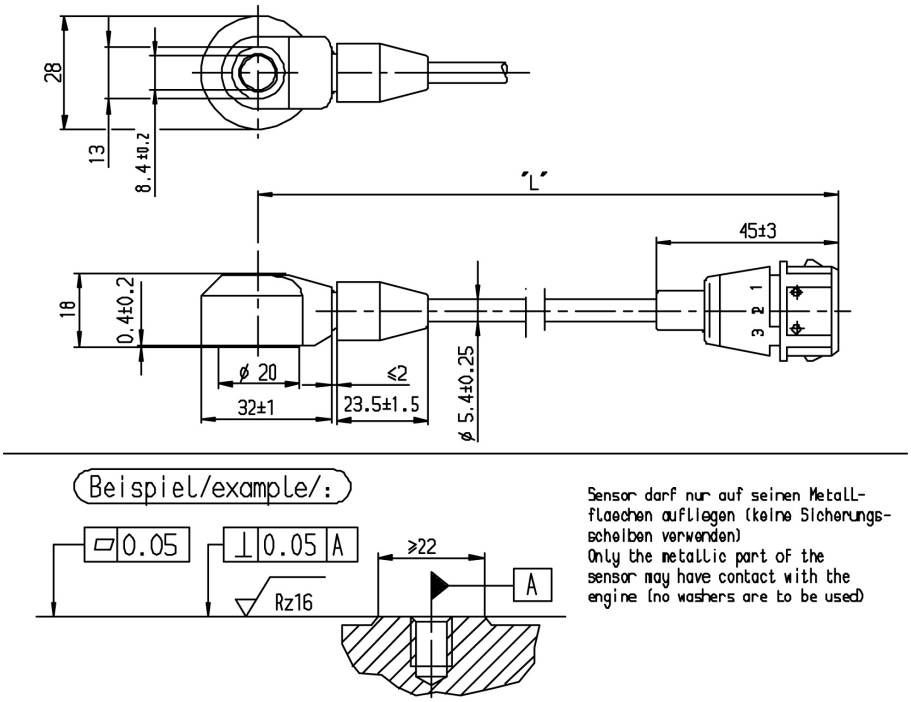
Mechanical data	
Thread	M8 x 30 (aluminium engine block) M8 x 25 (cast iron engine block)
Weight	82 g
Tightening torque	15 … 25 Nm
Length	100 … 500 mm

Conditions for use	
Temperature range	-40 … 180°C

Connector	
Cable harness connector	1 284 485 112

Electronic data	
Main resonance frequency	> 25 kHz
Impedance R:	> 1MΩ
C	1200 ± 400 pF
Measuring range	0,1 … 400 g
Sensitivity at 5 kHz	26 + 8 - 5 mV/g
Range of frequency	1 … 20 kHz

Order number	
	0 261 231 047
Offer drawing	**A 261 230 073-03**



Sensor darf nur auf seinen Metall-flaechen aufliegen (keine Sicherungs-scheiben verwenden)
Only the metallic part of the sensor may have contact with the engine (no washers are to be used)

Auflageflaeche soll rotationssymmetrisch zur Gewindebohrung bearbeitet werden.
The contact surface must be machined rotationally symmetrical to the threaded bore.

Rotary Potentiometers

Rotary Potentiometer RP 55

Possible range: 55°

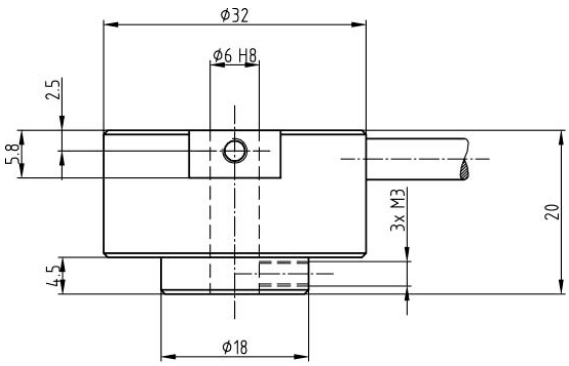
This sensor is designed to measure throttle position, chassis data acquisition and more. The sensor is manufactured in an aluminium housing. Various range and connector options are available on request.

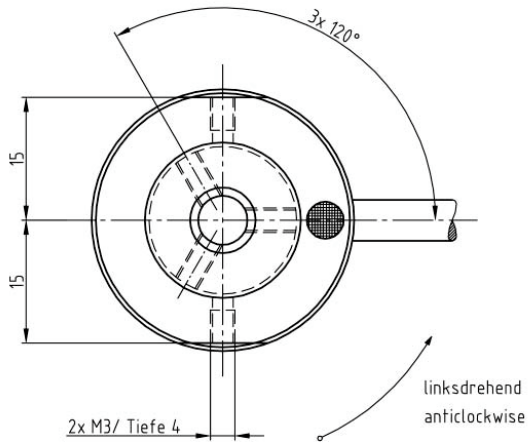
Mechanical data	
Mounting	2 x M3
Standard shaft	6 mm
Length	160 … 300 mm
Mech. range	360°
Tightening torque	0,5 Nm
Weight	41 g
Life expectancy	> 50 x 10^6 rotations

Conditions for use	
Temperature range	-25 … 75°C
Vibration	10 g/30 … 500 Hz

Electronic data	
Nominal resistance	5 kΩ
Resistance tolerance	20 %
Linearity	± 0,25 %
Temp. coefficient	5 ppm/°C
Max. current	10 mA
Max. power supply	50 V
Usual power supply	5 V

Order number	
AS-6-06-05PA-HE	**B 261 209 578**
Offer drawing	**A 261 209 578**





Rotary Potentiometer RP 86

Possible range: 86°

This sensor is designed to measure rotational movement, especially throttle positions. Each sensor is individually laser-calibrated.

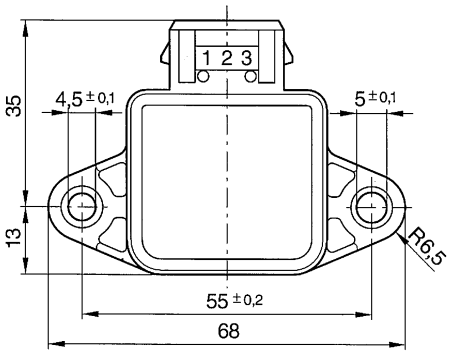
Mechanical data	
Mounting	2 x M4
Length	160 … 300 mm
Mech. range	< 86°
Max. rotation speed	120 x 1/min
Tightening torque	1,5 … 2,5 Nm
Weight	60 g
Life expectancy	> 2 x 10^5 rotations

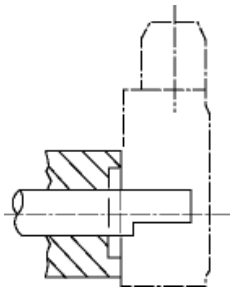
Electronic data	
Nominal resistance	2,5 kΩ
Resistance tolerance	20 %
Non-linearity	0,9 %
Repetitive accuracy	0,01 %
Temp. coefficient	< 5 ppm/°C
Max. power supply	42 V
Usual power supply	5 V

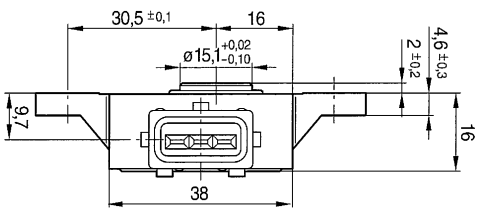
Conditions for use	
Temperature range	-40 … 130°C
Vibration	40 g/5 Hz … 2 kHz

Connector	
Cable harness connector	**1 928 402 868**

Order number	
	0 280 122 016
Offer drawing	**A 280 121 252**







Rotary Potentiometer RP 100

Possible range: 100°

This sensor is designed to measure rotational movement. Each sensor is individually laser- calibrated. It is manufactured in a DR-25 sleeve, various connector options are available.

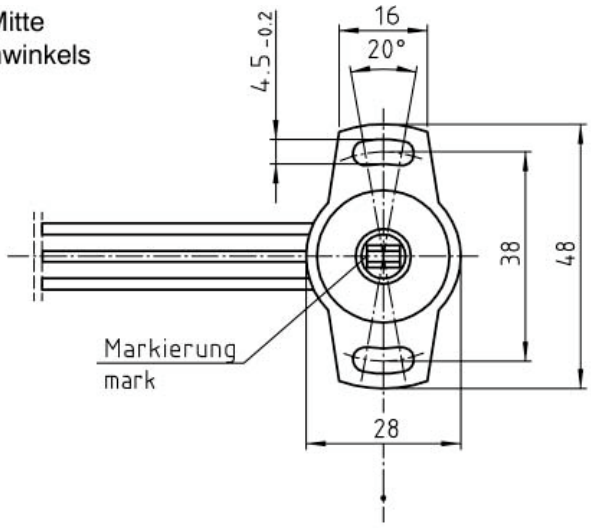
Mechanical data	
Mounting	2 x M4
Length	160 … 300 mm
Mech. range	360°
Max. rotation speed	120 x 1/min
Tightening torque	0,5 Nm
Weight	60 g
Lifetime	> 50 x 10^5 rotations

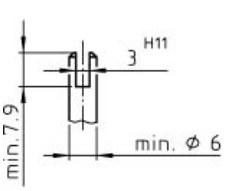
Electronic data	
Nominal resistance	3 kΩ
Resistance tolerance	20 %
Non-linearity	0,9 %
Repetitive accuracy	0,01 %
Temp. coefficient	< 5 ppm/°C
Max. power supply	42 V
Usual power supply	5 V

Conditions for use	
Temperature range	-20 … 150°C
Vibration	40 g/5 Hz … 2 kHz

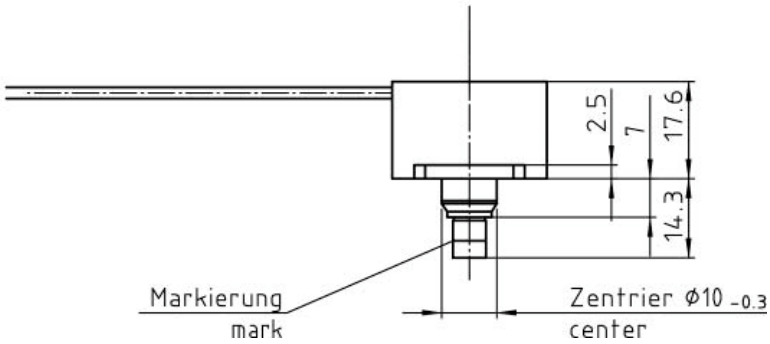
Order numbers	
KPSE 6E8-33P-DN	**B 261 209 113**
Offer drawing	**A 261 209 113**
AS 6-06-05PN	**B 261 209 117**
Offer drawing	**A 261 209 117**
KPTA 6E6-4P-C-DN	**B 261 209 119**
Offer drawing	**A 261 209 119**
AS 6-06-05PA-HE	**B 261 209 127**
Offer drawing	**A 261 209 127**

-Darstellung in der Mitte
des nutzbaren Drehwinkels
-drawing in middle
of useful range





- Abmessungen der
Antriebsseite
- dimension of
driveshaft



Rotary Potentiometer RP 130

Possible range: 130°

This sensor is designed to measure rotational movement. Each sensor is individually laser- calibrated. It is manufactured in a DR-25 sleeve, various connector options are available.

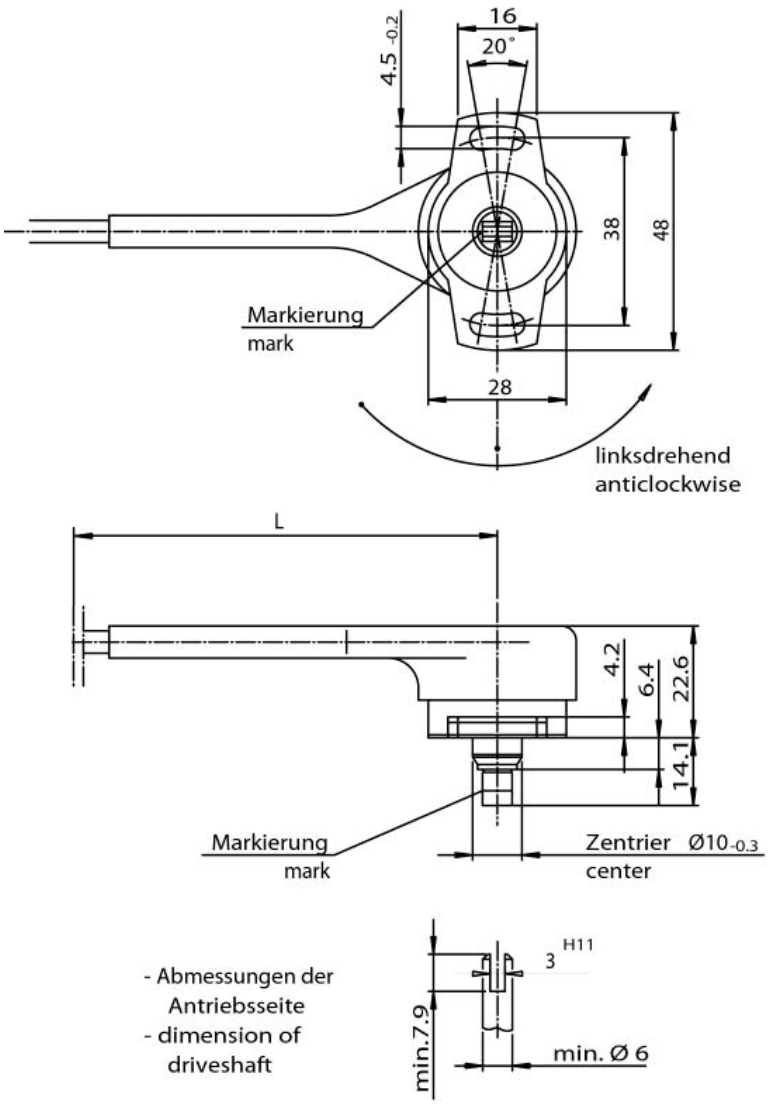
Mechanical data	
Mounting	2 x M 4
Length	160 … 300 mm
Mech. range	360°
Max. rotation speed	120 x 1/min
Tightening torque	0,5 Nm
Weight	60 g
Lifetime	> 50 x 10^5 rotations

Electronic data	
Nominal resistance	3 kΩ
Resistance tolerance	20 %
Non-linearity	0,9 %
Repetitive accuracy	0,01 %
Temp. coefficient	< 5 ppm/°C
Max. power supply	42 V
Usual power supply	5 V

Conditions for use	
Temperature range	-20 … 150°C
Vibration	40 g/5 Hz … 2 kHz

Order number	
KPSE 6E8-33P-DN	**B 261 209 114**
Offer drawing	**A 261 209 114**

- Darstellung in der Mitte des nutzbaren Drehwinkels
- drawing in middle of useful range



- Abmessungen der Antriebsseite
- dimension of driveshaft

Rotary Potentiometer RP 130-M

Possible range: 130°

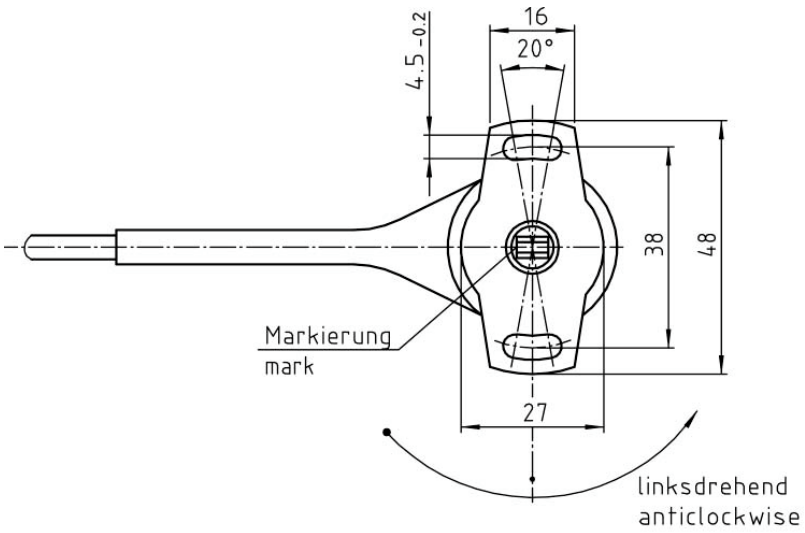
This sensor is designed to measure rotational movement. Each sensor is individually laser-calibrated. It is manufactured in a DR-25 sleeve, various connector options are available. Metal housing.

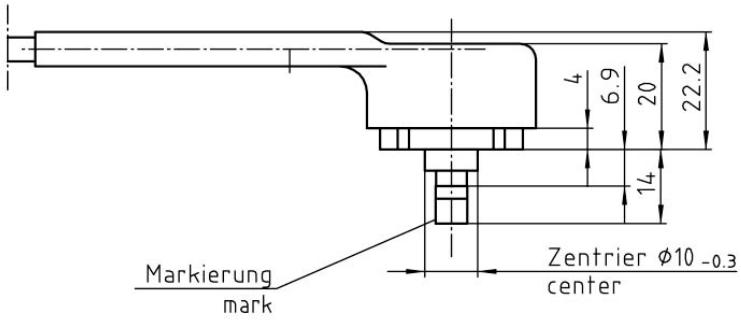
Mechanical data	
Mounting	2 x M4
Length	160 … 300 mm
Mech. range	360°
Max. rotation speed	120 x 1/min
Tightening torque	0,5 Nm
Weight	60 g
Lifetime	> 50 x 10^5 rotations

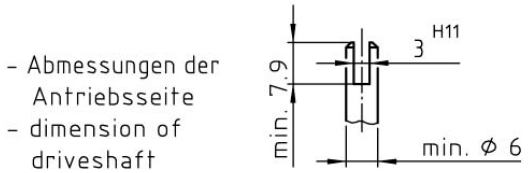
Electronic data	
Nominal resistance	6 kΩ
Resistance tolerance	20 %
Non-linearity	0,9 %
Repetitive accuracy	0,01 %
Temp. coefficient	< 5 ppm/°C
Max. power supply	42 V
Usual power supply	5 V

Conditions for use	
Temperature range	-55 … 125°C
Vibration	40 g/5 Hz … 2 kHz

Order number	
KPTA 6E6-4P-C-DN	**B 261 209 576**
Offer drawing	**A 261 209 573**


16
20°
4.5 -0.2
38
48
Markierung
mark
27
linksdrehend
anticlockwise


4
6.9
20
22.2
14
Markierung
mark
Zentrier ⌀10 -0.3
center


- Abmessungen der
Antriebsseite
- dimension of
driveshaft
min. 7.9
3 H11
min. ⌀ 6

Rotary Potentiometer RP 308

Possible range: 308°

This sensor is designed to measure rotational movement. Each sensor is individually laser- calibrated. It is manufactured in a DR-25 sleeve, various connector options are available.

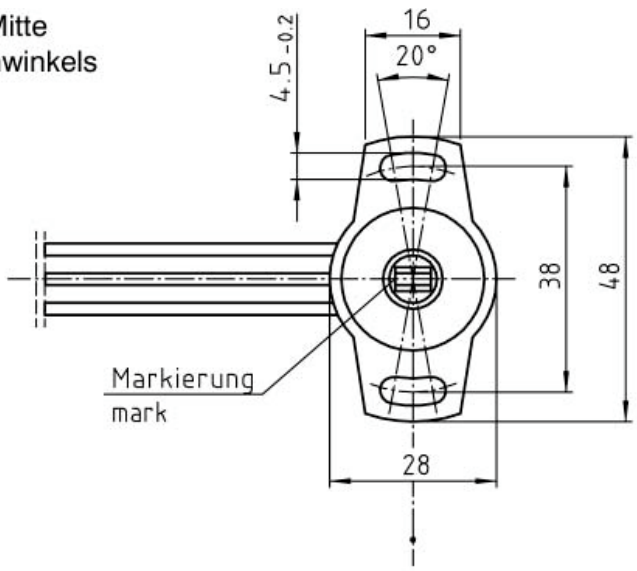
Mechanical data	
Mounting	2 x M4
Length	160 … 300 mm
Mech. range	± 360°
Max. rotation speed	120 x 1/min
Tightening torque	0,5 Nm
Weight	60 g
Lifetime	> 50 x 10^5 rotations

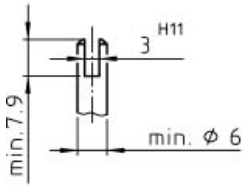
Electronic data	
Nominal resistance	5 kΩ
Resistance tolerance	20 %
Non-linearity	0,9 %
Repetitive accuracy	0,01 %
Temp. coefficient	< 5 ppm/°C
Max. power supply	42 V
Usual power supply	5 V

Conditions for use	
Temperature range	-20 … 150°C
Vibration	40 g/5 Hz … 2 kHz

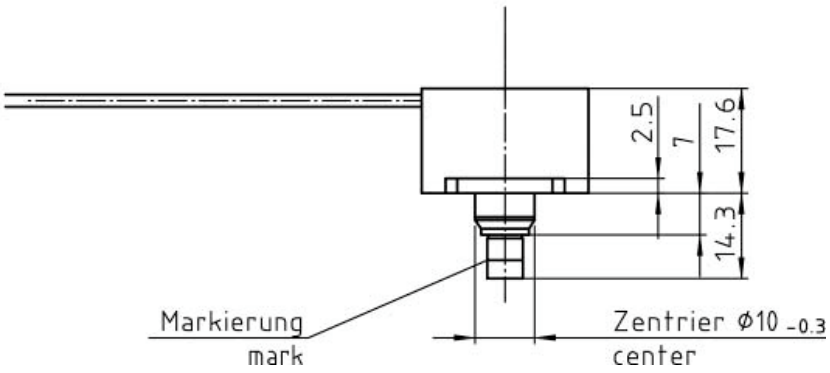
Order numbers	
KPSE 6E8-33P-DN	**B 261 209 115**
Offer drawing	**A 261 209 115**
KPTA 6E6-4P-C-DN	**B 261 209 118**
Offer drawing	**A 261 209 118**

-Darstellung in der Mitte
des nutzbaren Drehwinkels
-drawing in middle
of useful range





- Abmessungen der
Antriebsseite
- dimension of
driveshaft



Rotary Potentiometer RP 350-M

Possible range: 350°

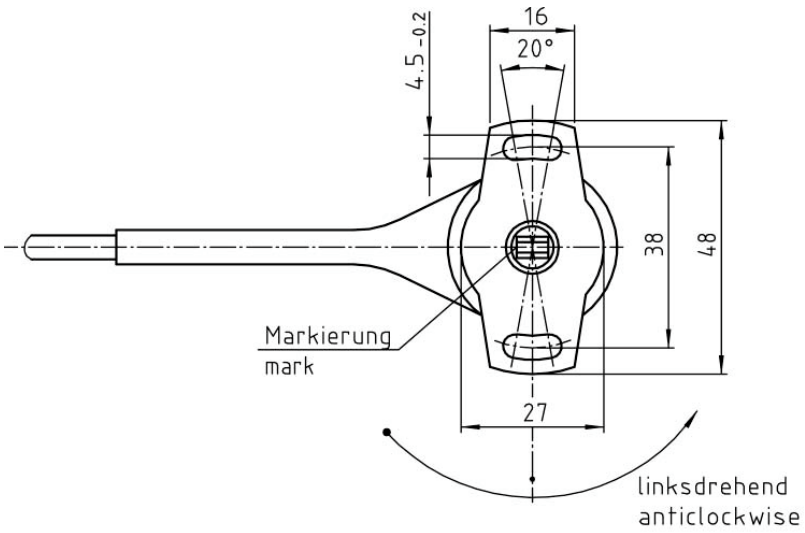
This sensor is designed to measure rotational movement. Each sensor is individually laser-calibrated. It is manufactured in a DR-25 sleeve, various connector options are available. Metal housing.

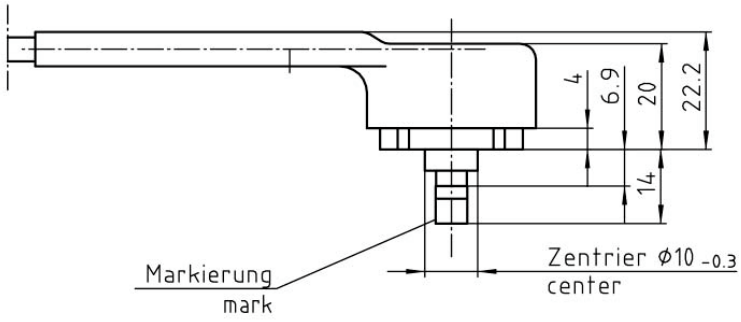
Mechanical data	
Mounting	2 x M4
Length	160 … 300 mm
Mech. range	360°
Max. rotation speed	120 x 1/min
Tightening torque	0,5 Nm
Weight	60 g
Lifetime	> 50 x 10^5 rotations

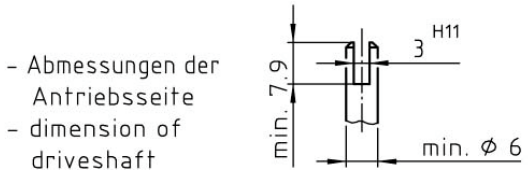
Electronic data	
Nominal resistance	6 kΩ
Resistance tolerance	20 %
Non-linearity	0,9 %
Repetitive accuracy	0,01 %
Temp. coefficient	< 5 ppm/°C
Max. power supply	42 V
Usual power supply	5 V

Conditions for use	
Temperature range	-55 … 125°C
Vibration	40 g/5 Hz … 2 kHz

Order number	
KPTA 6E6-4P-C-DN	**B 261 209 573**
Offer drawing	**A 261 209 573**


16
20°
4.5 -0.2
38
48
Markierung
mark
27
linksdrehend
anticlockwise


4
6.9
20
22.2
14
Markierung
mark
Zentrier ⌀10 -0.3
center


- Abmessungen der
Antriebsseite
- dimension of
driveshaft
min. 7.9
3 H11
min. ⌀ 6

Linear Potentiometers

Linear Potentiometer LP 10

Possible mechanical range: 10 mm

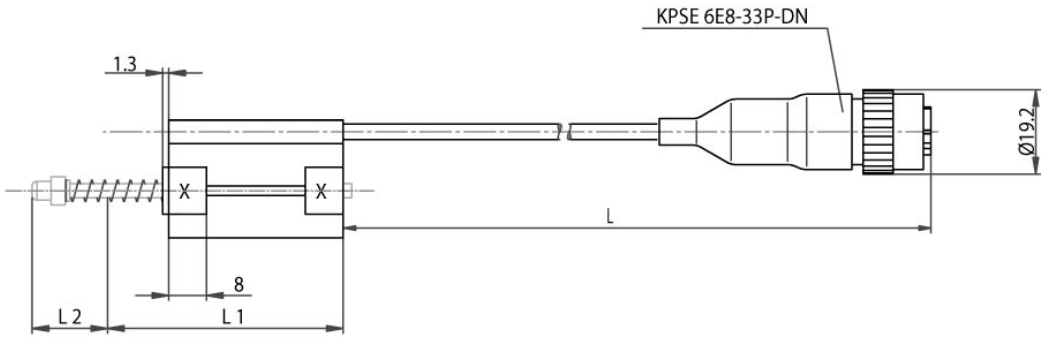
This sensor is designed to measure stabilizer movement. It is manufactured in a DR-25 sleeve. Various connector options are available.

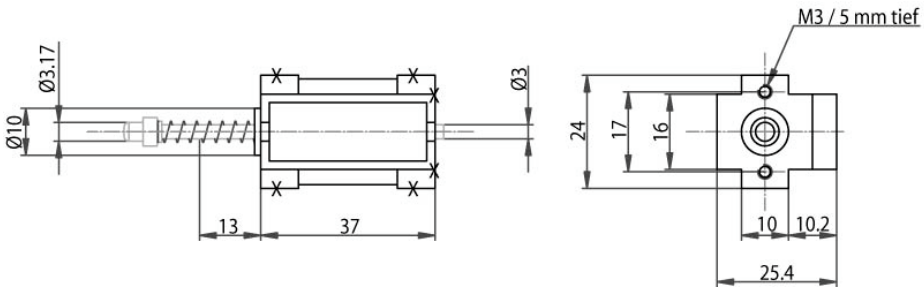
Mechanical data	
Mounting	2 x M3
Cable length	150 … 1000 mm
Weight	70 g

Conditions for use	
Temperature range	-25 … 75°C

Electronic data	
Nominal resistance	1 kΩ ± 20 %
Max. current	1 mA
Non-linearity	1 %
Usual power supply	5 V
Power consumption	0,3 W

Order number	
KPSE 6E8-33P-DN	**B 261 209 535**
Offer drawing	**A 261 209 535**





Linear Potentiometer LP 50

Possible mechanical range: 50 mm

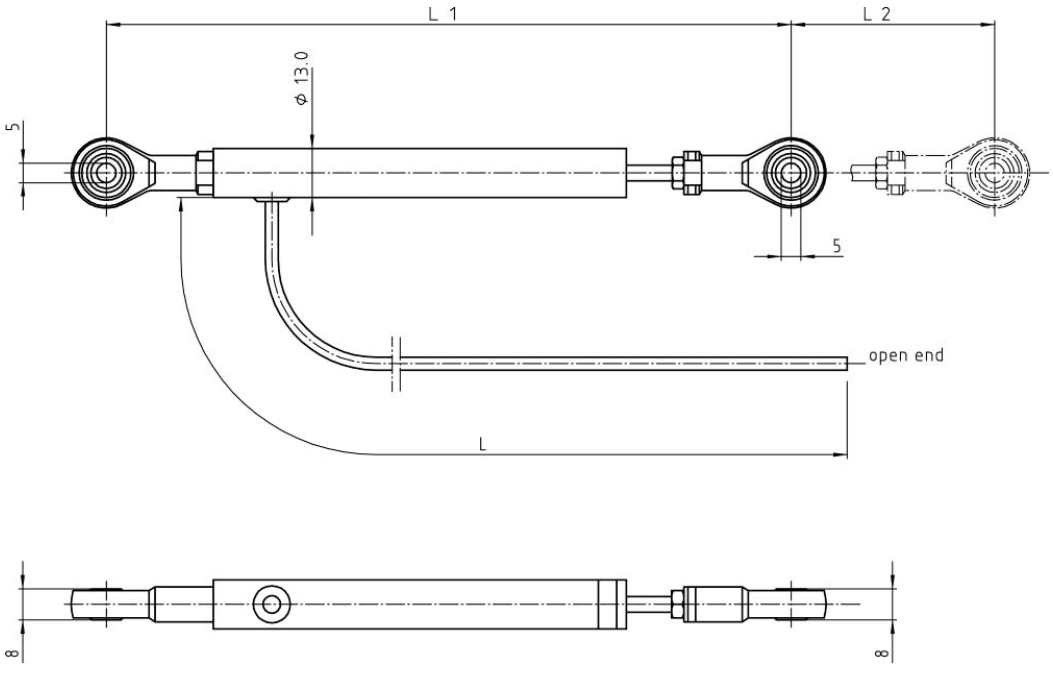
This sensor is designed to measure gear position, throttle position or suspension movement. It is manufactured in a DR-25 sleeve, various connector options are available.

Mechanical data	
Possible mech. range [L2]	50 mm
Min. length [L1]	172 mm
Cable length [L]	150 … 1000 mm
Mounting	2 x M5
Sealing	O-ring shaft seal
Tightening torque	10 Nm
Max. shaft velocity	1000 mm/sec
Weight [25 … 150 mm]	90 … 150 g

Conditions for use	
Temperature range	-20 … 85°C
Vibration	10 g/5 … 500 Hz
Shock	30 g/11 ms

Electronic data	
Nominal resistance [25 … 150 mm]	2 kΩ
Max. current	< 1 mA
Non-linearity	0,25 %
Usual power supply	5 V
Max. power supply	42 V

Order number	
KPTA 6E6-4P-C-DN	**B 261 209 136**
Offer drawing	**A 261 209 136**



Linear Potentiometer LP 75

Possible mechanical range: 75 mm

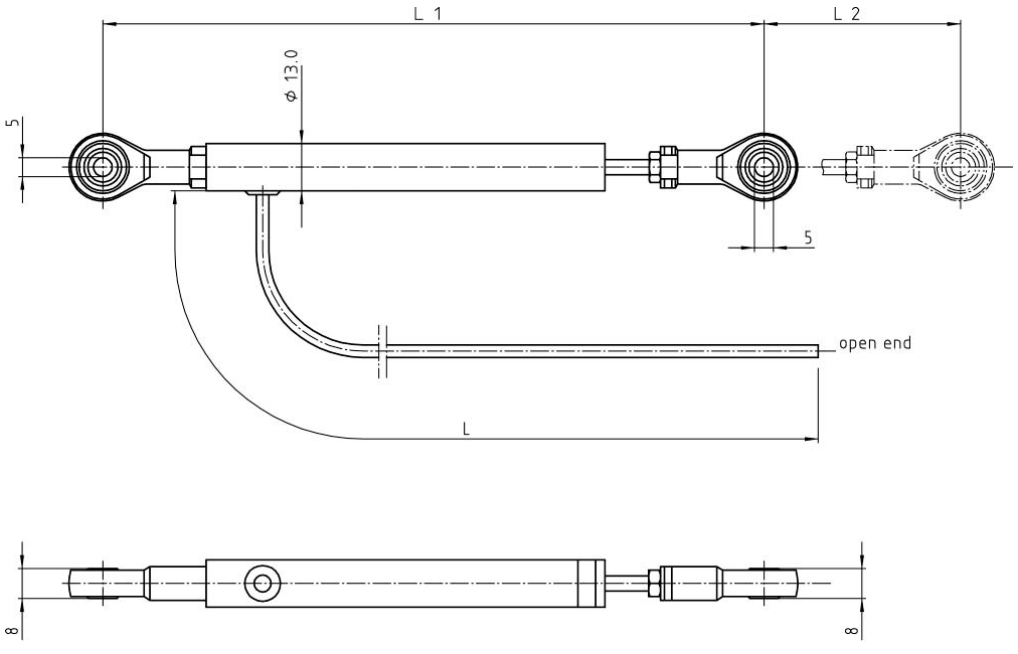
This sensor is designed to measure gear position, throttle position or suspension movement. It is manufactured in a DR-25 sleeve, various connector options are available.

Mechanical data	
Possible mech. range [L2]	75 mm
Min. length [L1]	197 mm
Cable length [L]	150 … 1000 mm
Mounting	2 x M5
Sealing	O-ring shaft seal
Tightening torque	10 Nm
Max. shaft velocity	1000 mm/sec
Weight [25 … 150 mm]	90 … 150 g

Conditions for use	
Temperature range	-20 … 85°C
Vibration	10 g/5 … 500 Hz
Shock	30 g/11 ms

Electronic data	
Nominal resistance [25 … 150 mm]	3 kΩ
Max. current	< 1 mA
Non-linearity	0,15 %
Usual power supply	5 V
Max. power supply	42 V

Order number	
KPSE 6E8-33P-DN	**B 261 209 530**
Offer drawing	**A 261 209 530**



Linear Potentiometer LP 100

Possible mechanical range: 100 mm

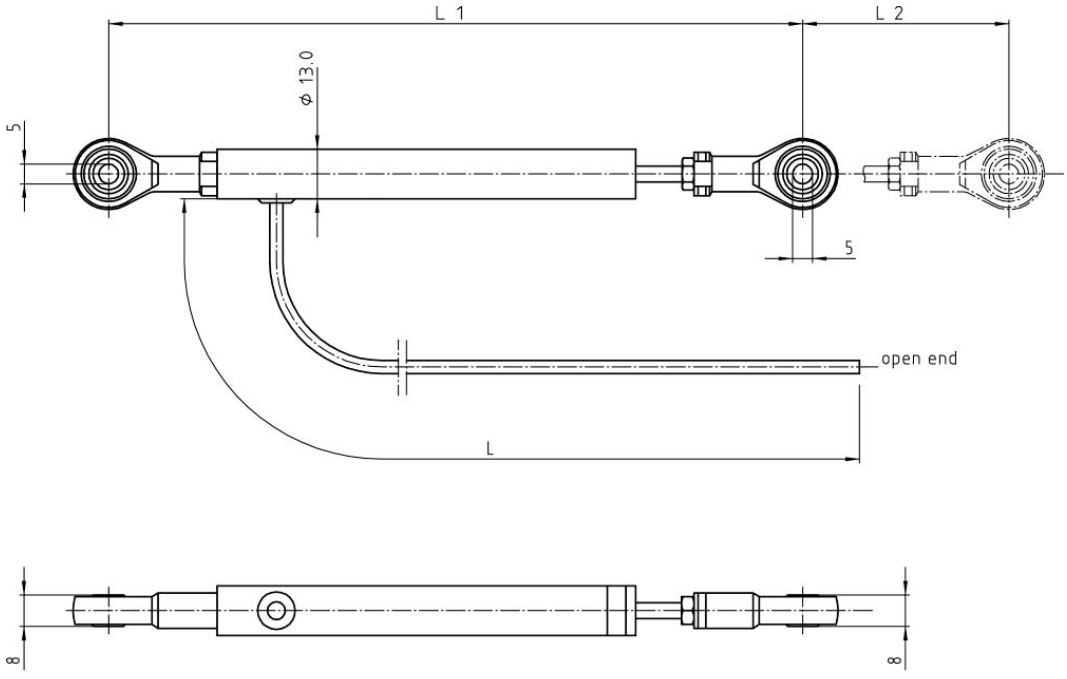
This sensor is designed to measure gear position, throttle position or suspension movement. It is manufactured in a DR-25 sleeve, various connector options are available.

Mechanical data	
Possible mech. range [L2]	100 mm
Min. length [L1]	227 mm
Cable length [L]	150 … 1000 mm
Mounting	2 x M5
Tightening torque	10 Nm
Sealing	O-ring shaft seal
Max. shaft velocity	1000 mm/sec
Weight [25 … 150 mm]	90 … 150 g

Conditions for use	
Temperature range	-20 … 85°C
Vibration	10 g/5 … 500 Hz
Shock	30 g/11 ms

Electronic data	
Nominal resistance [25 … 150 mm]	4 kΩ
Max. current	< 1 mA
Non-linearity	0,15 %
Usual power supply	5 V
Max. power supply	42 V

Order numbers	
KPSE 6E8-33P-DN	**B 261 209 134**
Offer drawing	**A 261 209 134**
KPTA 6E6-4P-C-DN	**B 261 209 137**
Offer drawing	**A 261 209 137**



Linear Potentiometer LP 150

Possible mechanical range: 150 mm

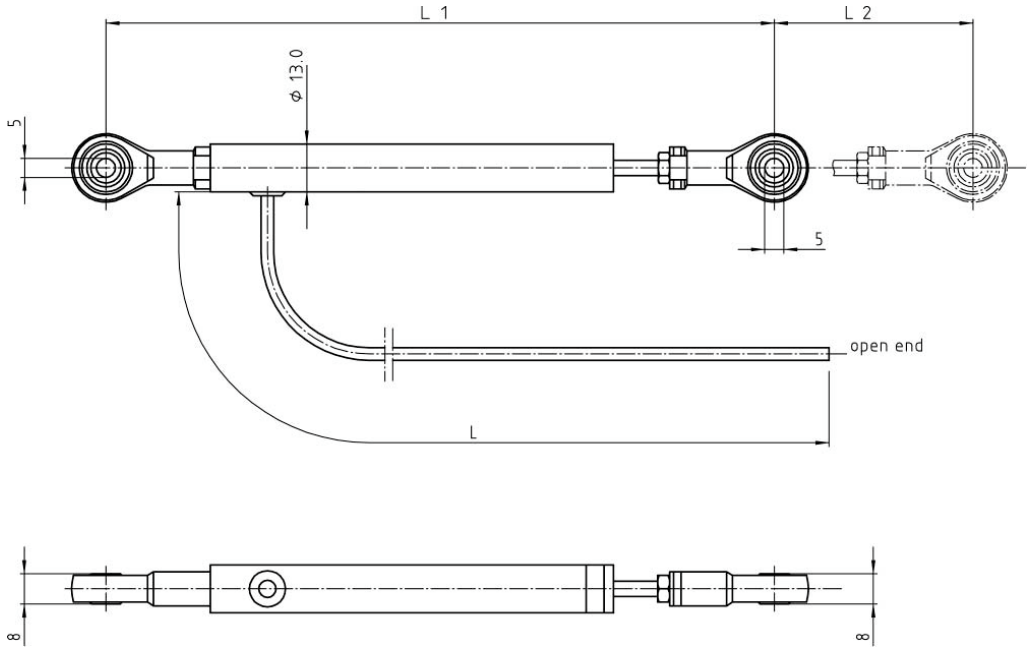
This sensor is designed to measure gear position, throttle position or suspension movement. It is manufactured in a DR-25 sleeve, various connector options are available.

Mechanical data	
Possible mech. range [L2]	150 mm
Min. length [L1]	282 mm
Cable length [L]	150 … 1000 mm
Mounting	2 x M5
Sealing	O-ring shaft seal
Tightening torque	10 Nm
Max. shaft velocity	1000 mm/sec
Weight [25 … 150 mm]	90 … 150 g

Conditions for use	
Temperature range	-20 … 85°C
Vibration	10 g/5 … 500 Hz
Shock	30 g/11 ms

Electronic data	
Nominal resistance [25 … 150 mm]	6 kΩ
Max. current	< 1 mA
Non-linearity	0,15 %
Usual power supply	5 V
Max. power supply	42 V

Order numbers	
KPTA 6E6-4P-C-DN	**B 261 209 138**
Offer drawing	**A 261 209 138**
AS 6-06-05PA-HE	**B 261 209 534**
Offer drawing	**A 261 209 534**



Wire Potentiometers

Wire Potentiometer WP 35

Possible mechanical range: 35 mm

Wire sensors are suitable for measuring linear and non-linear motions. The compact style allows flexible and easy installation. Due to the small size, precise measurement is possible even in difficult applications.

Various connector options available.

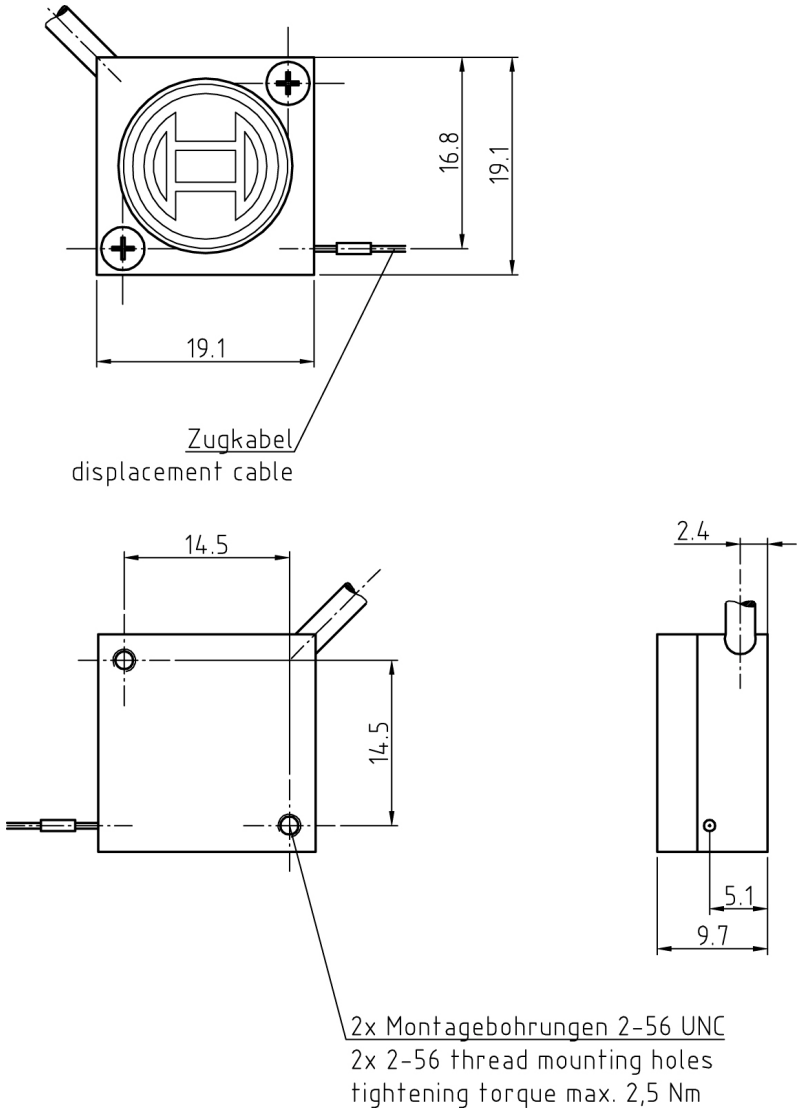
Mechanical data	
Possible mech. range	38,1 mm
Mounting	2 x 2-56 THD
Cable length	150 … 450 mm
Tightening torque	1,5 … 2,5 Nm
Weight	15 g
Life expectancy	50 x 10^6 rotations
Protection	IP 54
Dimensions	19 x 19 x 9,7 mm

Conditions for use	
Temperature range	-65 … 125°C
Max. cable acceleration	15 g
Max. cable tension	1,7 N
Shock	100 g for 6 ms
Vibration	10 Hz … 2 kHz at 15 g

Electronic data	
Nominal resistance	5,0 kΩ ± 10 %
Non-linearity	± 0,5 %
Usual power supply	5 V
Max. power supply	50 V

Order number	
AS 6-06-05PA-HE	**B 261 209 541**
Offer drawing	**A 261 209 541**

! Caution !
User, please observe the following:
• Ensure electrical connections are performed according to the enclosed Position Transducer User´s Guide.
• Do not allow the cable to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the cable at all times.


16.8
19.1
19.1
Zugkabel
displacement cable
14.5
14.5
2.4
5.1
9.7
2x Montagebohrungen 2-56 UNC
2x 2-56 thread mounting holes
tightening torque max. 2,5 Nm

Wire Potentiometer WP 50

Possible mechanical range: 50 mm

Wire sensors are suitable for measuring linear and non-linear motions. The compact style allows flexible and easy installation. Due to the small size, precise measurement is possible even in difficult applications.

Various connector options available.

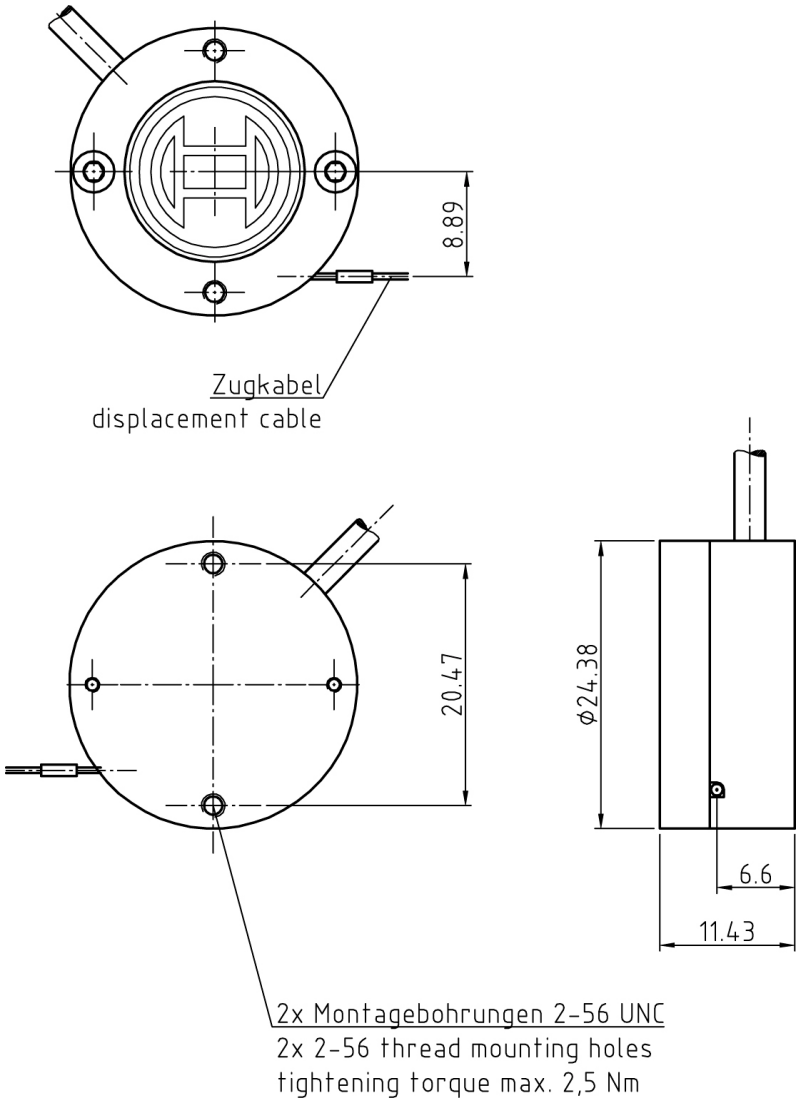
Mechanical data	
Possible mech. range	50,8 mm
Mounting	2 x 2-56 THD
Cable length	150 … 450 mm
Tightening torque	1,5 … 2,5 Nm
Weight	28 g
Life expectancy	50 x 10^6 rotations
Protection	IP 54
Dimensions	24,4 x 11,4 mm

Conditions for use	
Temperature range	-65 … 125°C
Max. cable acceleration	40 g
Max. cable tension	3,3 N
Shock	100 g for 6 ms
Vibration	10 Hz … 2 kHz at 15 g

Electronic data	
Nominal resistance	5,0 kΩ ± 10 %
Non-linearity	± 0,5 %
Usual power supply	5 V
Max. power supply	50 V

Order number	
AS 6-06-05PA-HE	**B 261 209 542**
Offer drawing	**A 261 209 542**

! Caution !
User, please observe the following:
• Ensure electrical connections are performed according to the enclosed Position Transducer User´s Guide.
• Do not allow the cable to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the cable at all times.


8.89
Zugkabel
displacement cable
20.47
ø24.38
6.6
11.43
2x Montagebohrungen 2-56 UNC
2x 2-56 thread mounting holes
tightening torque max. 2,5 Nm

Wire Potentiometer WP 75

Possible mechanical range: 75 mm

Wire sensors are suitable for measuring linear and non-linear motions. The compact style allows flexible and easy installation. Due to the small size, precise measurement is possible even in difficult applications.

Various connector options available.

Mechanical data	
Possible mech. range	76,2 mm
Mounting	2 x 2-56 THD
Cable length	150 … 450 mm
Tightening torque	1,5 … 2,5 Nm
Weight	28 g
Life expectancy	50 x 10^6 rotations
Protection	IP 54
Dimensions	32,5 x 11,4 mm

Conditions for use	
Temperature range	-65 … 125°C
Max. cable acceleration	17 g
Max. cable tension	3,3 N
Shock	100 g for 6 ms
Vibration	10 Hz … 2 kHz at 15 g

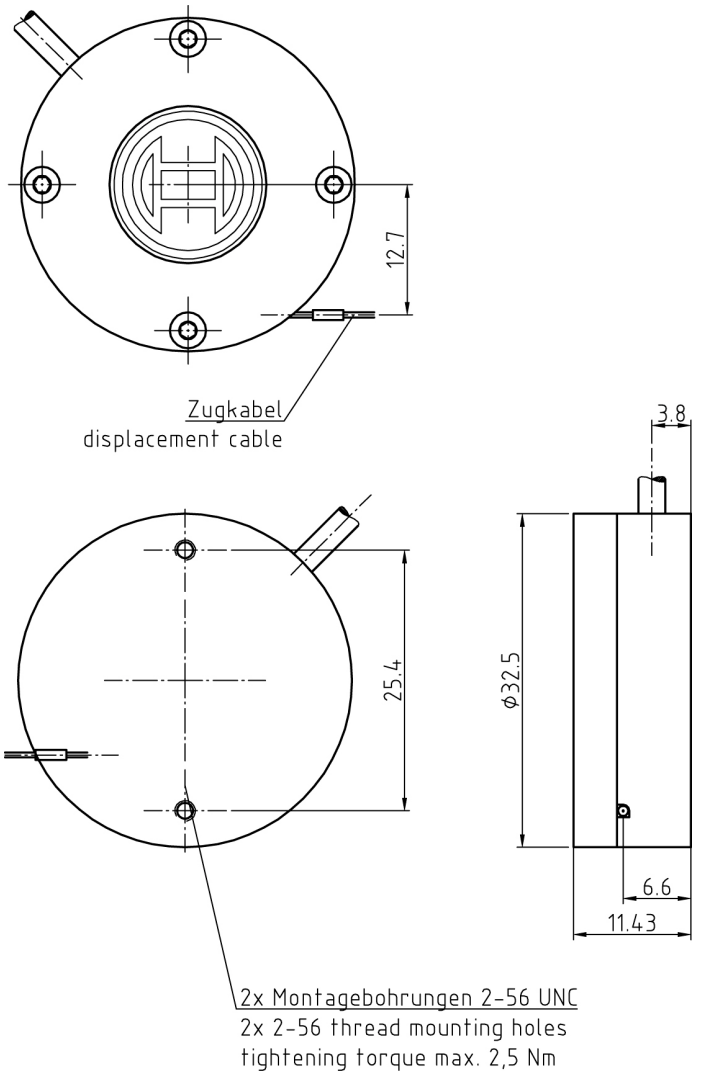
Electronic data	
Nominal resistance	5,0 kΩ ± 10 %
Non-linearity	± 0,5 %
Usual power supply	5 V
Max. power supply	38 V

Order number	
AS 6-06-05PA-HE	**B 261 209 543**
Offer drawing	**A 261 209 543**

! Caution !

User, please observe the following:

- Ensure electrical connections are performed according to the enclosed Position Transducer User´s Guide.
- Do not allow the cable to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the cable at all times.


12.7
Zugkabel
displacement cable
3.8
25.4
ϕ32.5
6.6
11.43
2x Montagebohrungen 2-56 UNC
2x 2-56 thread mounting holes
tightening torque max. 2,5 Nm

Wire Potentiometer WP 100

Possible mechanical range: 100 mm

Wire sensors are suitable for measuring linear and non-linear motions. The compact style allows flexible and easy installation. Due to the small size, precise measurement is possible even in difficult applications.

Various connector options available.

Mechanical data	
Possible mech. range	101,6 mm
Mounting	2 x 2-56 THD
Cable length	150 … 450 mm
Tightening torque	1,5 … 2,5 Nm
Weight	57 g
Life expectancy	50 x 10^6 rotations
Protection	IP 54
Dimensions	43,3 x 12,5 mm

Conditions for use	
Temperature range	-65 … 125°C
Max. cable acceleration	9 g
Max. cable tension	2,8 N
Shock	100 g for 6 ms
Vibration	10 Hz … 2 kHz at 15 g

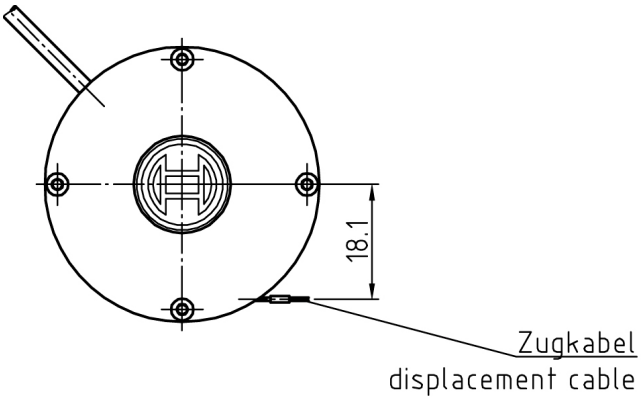
Electronic data	
Nominal resistance	5,0 kΩ ± 10 %
Non-linearity	± 0,5 %
Usual power supply	5 V
Max. power supply	38 V

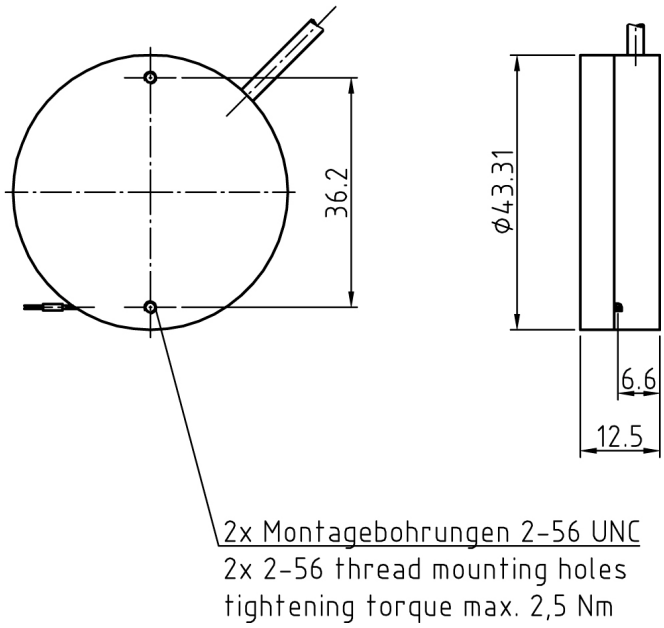
Order number	
AS 6-06-05PA-HE	**B 261 209 544**
Offer drawing	**A 261 209 544**

! Caution !

User, please observe the following:

- Ensure electrical connections are performed according to the enclosed Position Transducer User´s Guide.
- Do not allow the cable to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the cable at all times.


18.1
Zugkabel
displacement cable

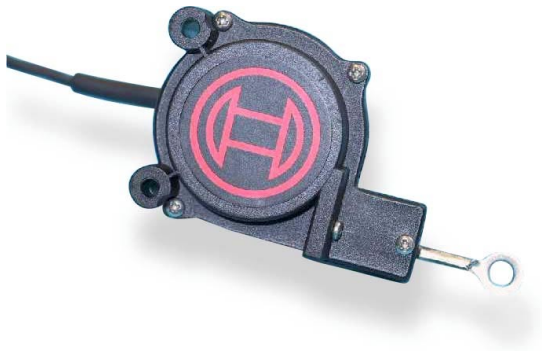

36.2
ø43.31
6.6
12.5
2x Montagebohrungen 2-56 UNC
2x 2-56 thread mounting holes
tightening torque max. 2,5 Nm

Wire Potentiometer WP 120

Possible mechanical range: 120 mm (96 mm on request)

Wire sensors are suitable for measuring linear and non-linear motions. The compact style allows flexible and easy installation. Due to the small size, precise measurement is possible even in difficult applications.

Manufactured in a DR-25 sleeve, various connector options available.



Mechanical data	
Possible mech. range	120 mm
Mounting	2 x M3
Cable length	150 … 1000 mm
Tightening torque	1,5 … 2,5 Nm
Weight	90 g
Life expectancy	1 x 10^6 rotations

Conditions for use	
Temperature range	-15 … 60°C
Max. moving speed	10 m/s

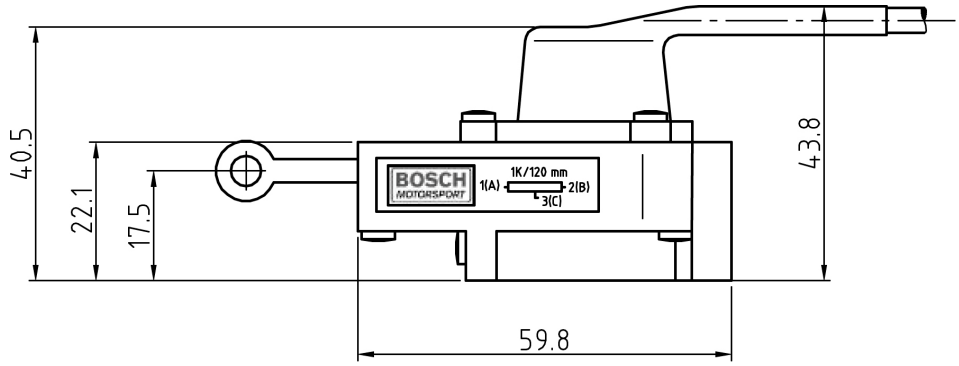
Electronic data	
Nominal resistance	1,0 kΩ
Non-linearity	± 1 %
Usual power supply	5 V
Max. power supply	25 V

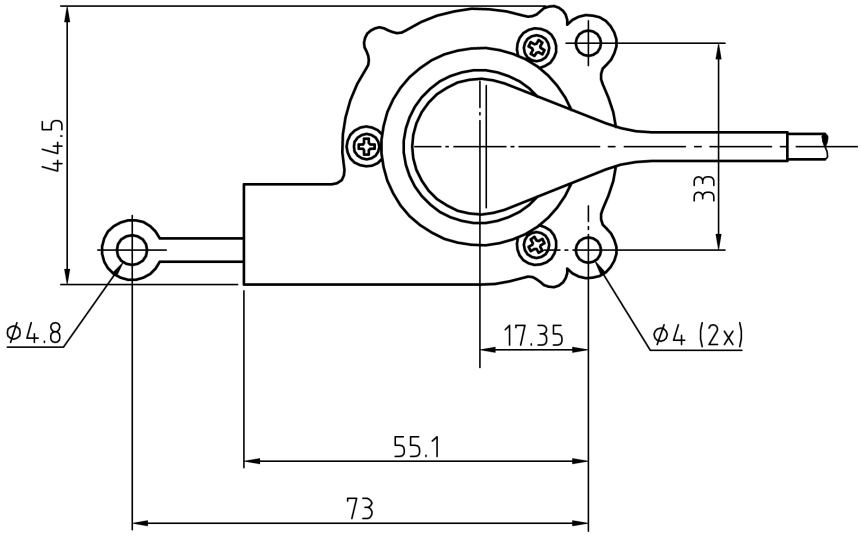
Order number	
120 mm	
KPTA 6E6-4P-C-DN	**B 261 209 536**
Offer drawing	**A 261 209 536**
96 mm	on request

! Caution !

User, please observe the following:

- Ensure electrical connections are performed according to the enclosed Position Transducer User´s Guide.
- Do not allow the cable to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the cable at all times.


40.5
22.1
17.5
43.8
BOSCH
MOTORSPORT
1K/120 mm
1(A)
2(B)
3(C)
59.8


44.5
33
ϕ4.8
17.35
ϕ4 (2x)
55.1
73

Wire Potentiometer WP 125

Possible mechanical range: 125 mm

Wire sensors are suitable for measuring linear and non-linear motions. The compact style allows flexible and easy installation. Due to the small size, precise measurement is possible even in difficult applications.

Various connector options available.

Mechanical data	
Possible mech. range	127,5 mm
Mounting	2 x 2-56 THD
Cable length	150 … 450 mm
Tightening torque	1,5 … 2,5 Nm
Weight	85 g
Life expectancy	50 x 10^6 rotations
Protection	IP 54
Dimensions	50,5 x 13,2 mm

Conditions for use	
Temperature range	-65 … 125°C
Max. cable acceleration	8 g
Max. cable tension	2,5 N
Shock	100 g for 6 ms
Vibration	10 Hz … 2 kHz at 15 g

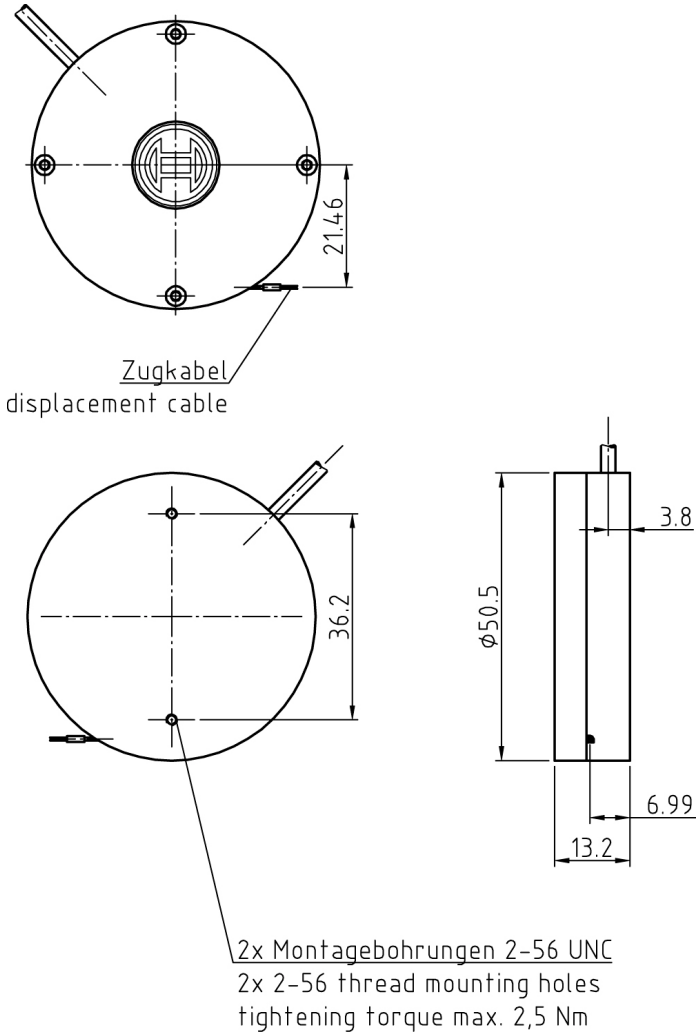
Electronic data	
Nominal resistance	5,0 kΩ ± 10 %
Non-linearity	± 0,5 %
Usual power supply	5 V
Max. power supply	38 V

Order number	
AS 6-06-05PA-HE	**B 261 209 545**
Offer drawing	**A 261 209 545**

! Caution !

User, please observe the following:

- Ensure electrical connections are performed according to the enclosed Position Transducer User´s Guide.
- Do not allow the cable to snap back (freely retract). This will cause damage and void the warranty. Tension must be maintained on the cable at all times.


21.46
Zugkabel
displacement cable
36.2
3.8
ϕ50.5
6.99
13.2
2x Montagebohrungen 2-56 UNC
2x 2-56 thread mounting holes
tightening torque max. 2,5 Nm

Acceleration Sensors

Accelerometer AM 5

This accelerometer is available to measure two axes in a single, robust package.

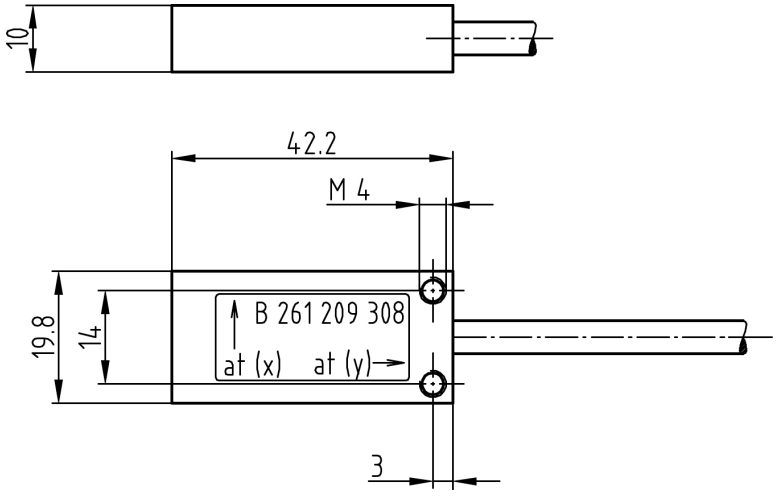
Mechanical data	
Weight	39 g
Length	150 … 1000 mm
Measuring range	± 5 g
Overload	± 50 g
Dimensions	10 x 19,8 x 42,2 mm

Conditions for use	
Temperature range	-25 … 125°C

Electronic data	
Supply voltage	12 V
Signal output	0 … 5 V
Standard filter	10 Hz
Frequency response	1 ms

Characteristic	
Offset	2,5 V at 0 g
Sensitivity	500 mV/g

Order number	
AS 6-06-05 PA-HE	**B 261 209 308**
Offer drawing	**A 261 209 308**



Accelerometer AM 500

This accelerometer is used in cars as part of the ABS and ASR systems. With reference to its fitting position, longitudinal and transversal acceleration up to 5 g can be measured. It is manufactured in a DR-25 sleeve, various connector options are available.

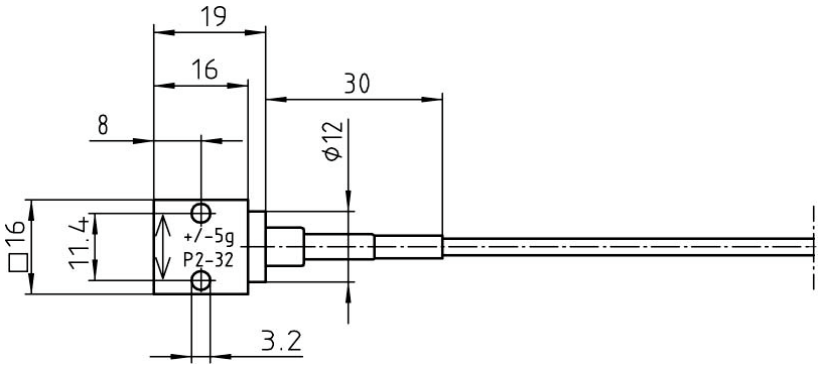
Mechanical data	
Weight	45 g
Length	150 … 1000 mm
Measuring range	± 5 g
Overload	± 500 g
Dimensions	16 x 16 x 16 mm
Fixing	2 x M3
Tightening torque	2 Nm

Conditions for use	
Temperature range	0 … 60°C

Electronic data	
Supply voltage	5 V
Max. supply voltage	6 V
Signal output	1 … 4 V
Standard filter	10 Hz
Resonant frequency	ca. 390 Hz

Characteristic	
Offset	2,5 V ± 0,1 V at 0 g
Sensitivity	300 mV/g

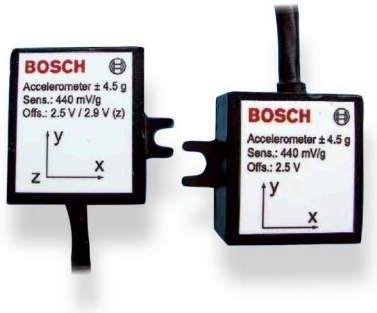
Order numbers	
KPTA 6E6-4P-C-DN	**B 261 209 003**
Offer drawing	**A 261 209 003**
AS 6-06-05PA-HE	**B 261 209 302**
Offer drawing	**A 261 209 302**



Accelerometer AM 600

This accelerometer is available to measure up to three axes in a single, robust package. It is used in cars as a part of the ABS and ASR systems. With reference to its fitting position, longitudinal, transversal and horizontal acceleration up to 4,5 g can be measured.

Manufactured in DR-25 sleeve; various connector options available.



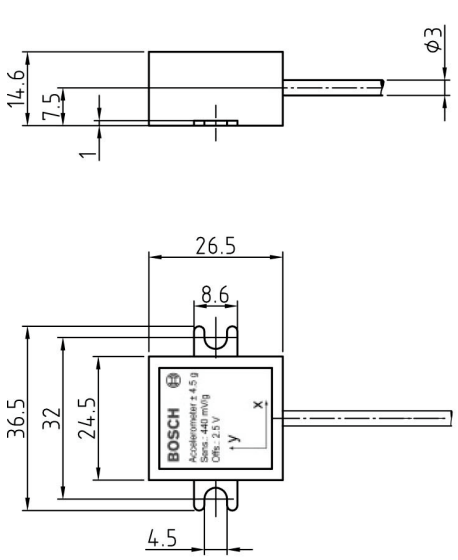
Mechanical data	
Weight (2 axes)	30 g
Weight (3 axes)	50 g
Length	150 … 1000 mm
Measuring range	± 4,5 g
Overload	± 600 g
Dimensions	
2 axes	24,5 x 26,5 x 14,6 mm
3 axes	24,5 x 26,5 x 29,5 mm
Fixing	2 x M3
Tightening torque	2 Nm

Conditions for use	
Temperature range	-40 … 85°C

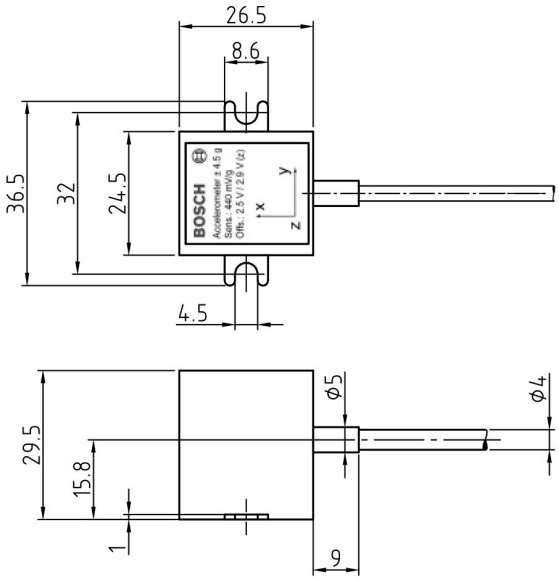
Characteristic	
Offset x,y	2,5 V at 0 g
Offset z	2,9 V at 0 g
Sensitivity x,y,z	440 mV/g

Electronic data	
Supply voltage	5 V DC ± 0,001 V
Max. supply voltage	6 V DC
Signal output	2,5 V = 0 g; 440 mV/g
Supply current	7 mA
Max. current	12 mA
Tolerance of sensitivity	± 3 %
Non-linearity of sensitivity	± 2 %

Order numbers	
2 axes	
AS 6-06-05PA-HE	**B 261 209 303**
Offer drawing	**A 261 209 303**
AS 6-08-35PN	**B 261 209 304**
Offer drawing	**A 261 209 304**
3 axes	
AS 6-06-05PA-HE	**B 261 209 306**
Offer drawing	**A 261 209 306**
AS 6-10-98PN	**B 261 209 307**
Offer drawing	**A 261 209 307**


14.6
7.5
1
ϕ3
26.5
8.6
36.5
32
24.5
4.5
BOSCH
x
y

2 axes


26.5
8.6
36.5
32
24.5
4.5
BOSCH
x
y
z
29.5
15.8
1
ϕ5
ϕ4
9

3 axes

Yaw Rate Sensor

Yaw Rate Sensor YRS

The principle of the angular rate sensor is based on a vibrating cylinder-gyrometer. A metal cylinder is excited to an amplitude controlled resonance vibration. Occurring nodes are displaced by the impact of a coriolis force. This displacement is shifted back to its “zero” position by a closed loop control. The required measure to do so is a measure for the applied angular rate.

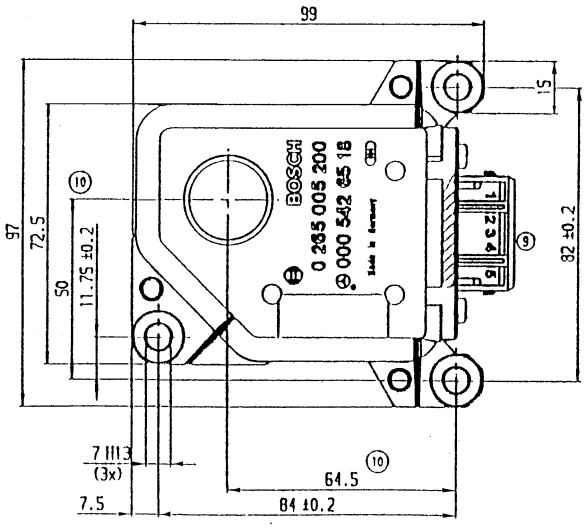
Mechanical data	
Measuring range	100°/s
Overload	300°/s
Weight	210 g

Conditions for use	
Temperature range	-30 … 85°C
Shock	300 g

Connector	
Cable harness connector	**1 284 485 232**

Electronic data	
Supply voltage	8,2 … 16 V
Current consumption	< 40 mA
Power consumption	0,7 W
Output range	0,6 … 4,4 V
Reference voltage	2,5 V
Voltage range	1,8 V
Electrical noise	< 0,25°s/0,1 … 100 Hz
Sensitivity	18 mVs/° [-100 … 100°/s]

Order number	
	0 265 005 206
Offer drawing	**A 265 466 074**



Ride Height System

Ride Height System RHS

This infrared sensor is designed to measure chassis adjust like vehicle ride height, pitch and roll. The sensor is available in a DR-25 sleeve with various connector options on request.

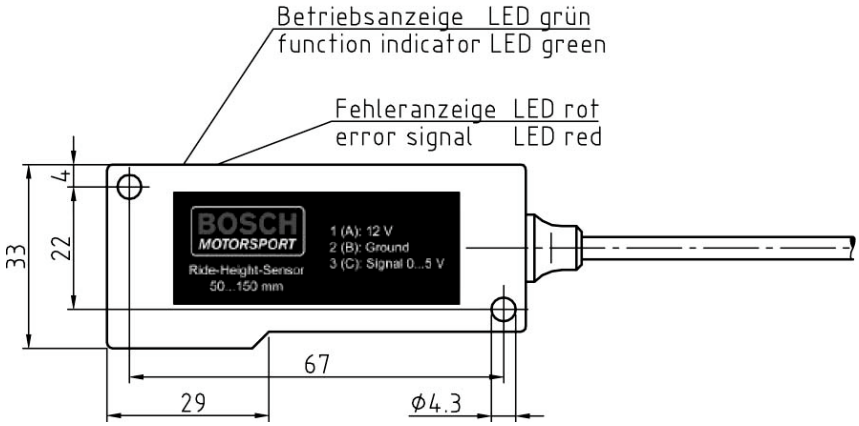
Mechanical data	
Weight	105 g
Measuring range	60 … 140 mm
Dimensions	75 x 33 x 18 mm
Housing	plastic, fibreglass
Protection class	IP 67

Electronic data	
Supply voltage	12 … 24 V
Signal output	0,25 … 4,75 V
Alarm output	PNP
Response time	5 ms
Resolution	0,5 … 1 mm
Linearity	2 % FS

Conditions for use	
Temperature range	-10 … 60°C

Characteristic	
Light source	IR
Max. allowed ambient light	< 10000 lux
Wave length	660 nm

Order number	
KPTA 6E6-4P-C-DN	**B 261 209 671**
Offer drawing	**A 261 209 671**



Gear Shift Sensors

Gear Shift Sensor GSS

This sensor is specially designed for precision gear shift force measurement. It can be integrated into the gear shift lever of a sequential gear box. It is manufactured in a DR-25 sleeve, various connector options are available.

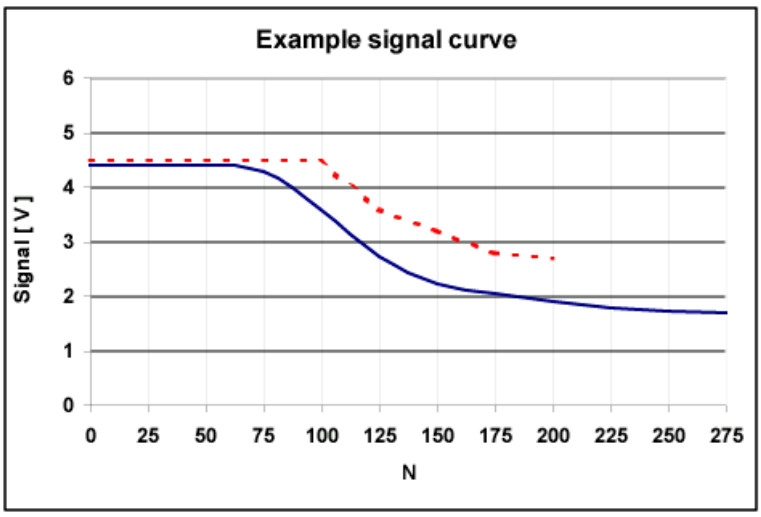
Mechanical data	
Weight	90 g
Max. deviation	± 10°
Fixing	2 x M10 x 1
Tightening torque	16 Nm
Dimensions	22 x 22 x 50 mm

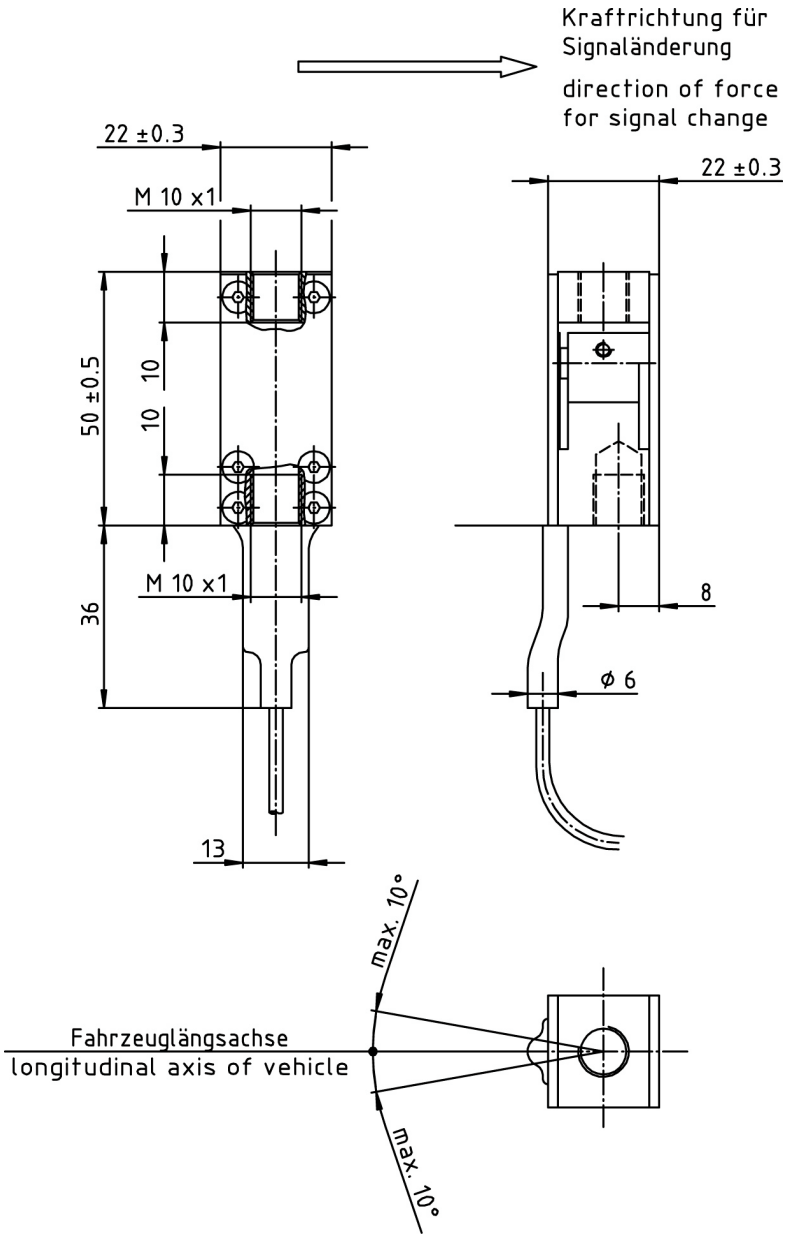
Conditions for use	
Temperature range	0 … 80°C
Vibration	80 g/5 Hz … 2 kHz

Characteristic
Individual characteristic will be delivered with each sensor.

Electronic data	
Supply voltage	10 V
Input current	< 1 mA
Signal output	1 … 4 V ± 0,5 V
Zero output	4 V ± 0,3 V

Order numbers	
KPSE 6E8-33P-DN	**B 261 209 222**
Offer drawing	**A 261 209 222**
KPTA 6E6-4P-C-DN	**B 261 209 224**
Offer drawing	**A 261 209 224**
AS-6-06-05PC-HE	**B 261 209 225**
Offer drawing	**A 261 209 225**




Kraftrichtung für
Signaländerung
direction of force
for signal change
22 ±0.3
M 10 x1
50 ±0.5
10
10
M 10 x1
36
13
22 ±0.3
8
ø 6
max. 10°
Fahrzeuglängsachse
longitudinal axis of vehicle
max. 10°

Gear Shift Sensor GSS-2

This sensor is specially designed for precision gear shift force measurement. It can be integrated into the gear shift lever of a sequential gear box. It is manufactured in a DR-25 sleeve, various connector options are available.

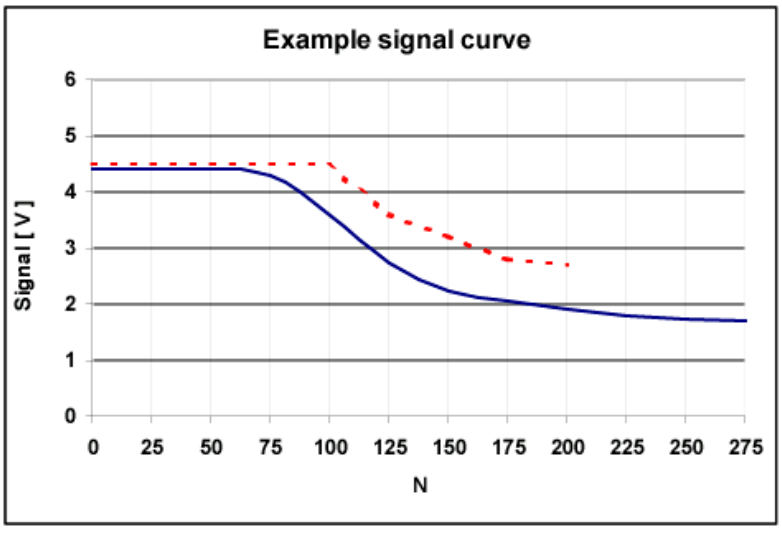
Mechanical data	
Weight	90 g
Max. deviation	± 10°
Fixing	2 x M10 x 1
Tightening torque	16 Nm
Dimensions	65 x 16 x 16 mm
Mech. Range (other ranges on request)	± 45 kg/450 N
Dimensions	16 x 16 x 66 mm

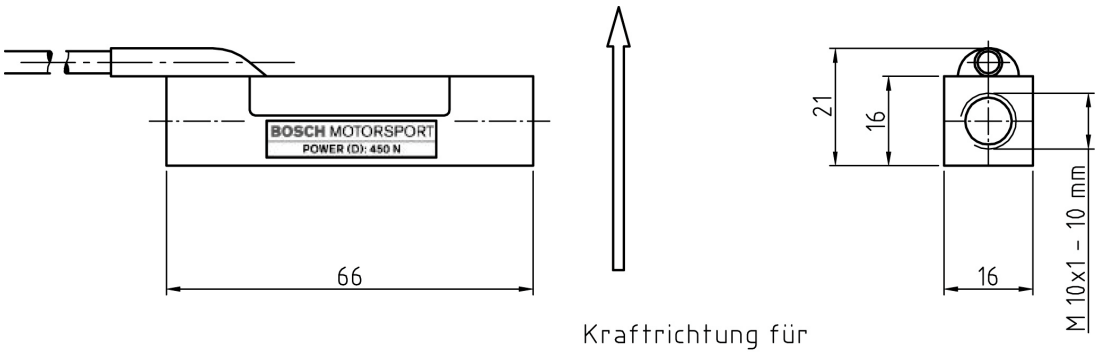
Electronic data	
Supply voltage	12 V
Signal output	0,5 … 4,5 V
Zero output	2,5 V

Order number	
AS-6-06-05PC-HE	on request
Offer drawing	on request

Conditions for use	
Temperature range	0 … 85°C
Vibration	80 g/5 Hz … 2 kHz

Characteristic
Individual characteristic will be delivered with each sensor.





Kraftrichtung für Signaländerung

direction of force for signal change

Displays

Display DDU 2

The DDU 2 is a light dashboard controller with an integrated display unit, providing the driver with various types of information.

The basic model contains 6 different pages, programmable warning message for exceeded limits, shift up- and warning lights. These features are fully programmable to correspond to individual customer requirements.

Additional to the functions of the “Basic”-version the “Night”-version offers variable brightness.

As well we developed a cost-optimised version of the display unit. This “Light”-version offers 3 different pre-programmed fixed pages and refrains from a link to an application tool.

Graphic module	
LCD display with high contrast	(320 x 240 pixels)
CFL illumination	
Dot size	0,3 x 0,3 mm
Visible display	100 x 75 mm (4,7 inches)

Mechanical data	
Dimensions	172 x 125 x 36 mm
Weight	495 g
Dust and water proof housing	
2 LED for warning lights	
5 LED for shift up indication	

Conditions for use	
Vibration	6 g/20 Hz ... 2 kHz
Temperature	-10 ... 65°C

Electronic data
1x CAN interface for data transfer
(reconstruction from CAN to K-Line possible)
1x RS 232 interface for programming
1x input for wheelspeed (Ind./Hall)
1x input for engine revolutions (Ind./Hall)
1x 5 V output for sensor supply
8 inputs 0 V-5 V (analog/digital)
8 programmable pull-up resistors for analog inputs
2 switch outputs (pushpull 0,5 A)
5 outputs for external shift up indication
(open collector, 100 mA)
7 outputs for external 7-segment display
(1 Digit, open collector, 100 mA)
1x internal temperature measurement (NTC)

Variations
DDU 2-Basic:
up to 6 different programmable displays
programmable warning messages for exceeded limits
2 warning lights
shift up lights
for generating displays and programming warning lights a tool is available
DDU 2-Night:
Basic with variable brightness
DDU 2-Light:
3 different displays, not programmable
2 warning lights
shift up lights
warning messages for oil temperature, oil pressure, water temperature and fuel pressure

Switches	
Dimmer switch LED	**B 261 209 647**
Dimmer switch display	**B 261 209 646**
Display position switch	**B 261 209 144**
Display toggle switch	**on request**

Order numbers	
DDU 2-Basic	**B 261 208 575**
DDU 2-Night	**B 261 208 573**
DDU 2-Light	**B 261 208 579**

Display DDU 3

The DDU 3 is a light and compact dash-board controller with an integrated display unit, providing the driver with various types of information.

Shift lights are designed as a satellite box to give maximum flexibility for the mount-ing position. 6 different displays are fully programmable to correspond to individual customer requirements.

The dashboard is equipped with various brightness and contrast. As well we de-veloped a cost-optimised version of the display unit. This “Light”- version offers 3 different pre-programmed fixed pages and refrains from a link to an application tool.

Graphic module	
LCD display with high contrast (320 x 240 pixels)	
LED illumination	
Dot size	0,22 x 0,22 mm
Visible display	78 x 59 mm
Weight	312 g

Mechanical data	
Dimensions	118 x 80 x 25 mm
Dust and waterproof aluminium housing	
Touch keys for brightness and contrast	

Conditions for use	
Vibration	6 g/20 Hz ... 2 kHz
Temperature	-10 ... 65°C

Shift indication satellite	
Dimensions	95 x 20 x15 mm
Weight	51 g
Single LED elements	5

Electronic data
1x CAN interface for data transfer (reconstruction from CAN to K-Line possible)
1x RS 232 interface for programming
Shift indication satellite controlled by the graphic module, 5 LEDs for shift up indication (open col-lector, 100 mA)
Output for external 7-segment display (1 Digit), (open collector, 100 mA)
8 inputs 0 … 5 V (analogous/digital)

Switches	
Display position switch	**B 261 209 144**

Order number
F 01E B01 130

Display DDU Formula

The DDU Formula is a light and compact dashboard controller with an integrated display unit, providing the driver with various types of information.

Shift lights are designed as a satellite box to give maximum flexibility for the mounting position. 3 different displays are available to correspond to individual customer requirements.

The dashboard is equipped with various brightness and contrast.

Graphic module	
LCD display with high contrast (320 x 240 pixels)	
LED illumination	
Dot size	0,22 x 0,22 mm
Visible display	78 x 59 mm
Weight	312 g

Mechanical data	
Dimensions	118 x 80 x 25 mm
Dust and waterproof aluminium housing	
Touch keys for brightness and contrast	

Conditions for use	
Vibration	6 g/20 Hz ... 2 kHz
Temperature	-10 ... 65°C

Shift indication satellite	
Dimensions	95 x 20 x15 mm
Weight	51 g
Single LED elements	5

Electronic data
1x CAN interface for data transfer (reconstruction from CAN to K-Line possible)
1x RS 232 interface for programming
Shift indication satellite controlled by the graphic module, 5 LED for shift up indication (open collector, 100 mA)
Output for external 7-segment display (1 Digit), (open collector, 100 mA)
2 inputs 0 … 5 V (analogous/digital)

Switches	
Display position switch	**B 261 209 144**

Order number
F 01E B01 126

Actuators

Injection Valves

Injection Valve EV 6

The development of the EV 6 took into account all the essential functional requirements which originate from injector operation in multipoint electronic fuel injection systems (EFI).

This resulted in: low weight, “dry” solenoid winding, plastic encapsulation, finely matched flow-rate classes, good valve-seat sealing, excellent hot-start capabilities, close tolerances of the specified functional values, high level of corrosion resistance and long service life.

Mechanical data	
System pressure	max. 8 bar
Weight	45, 8 g

Electrical data	
Solenoid resistance	e.g. 12 Ω
Max. power supply	16 V

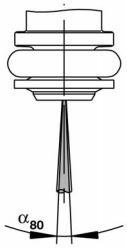
Conditions for use	
Fuel input	axial (top-feed)
Operating temperature	-40 ... 110°C
Permissible fuel temperatures	≤ 70°C
Climate proofness corresponds to saline fog test DIN 53 167	

Technical data

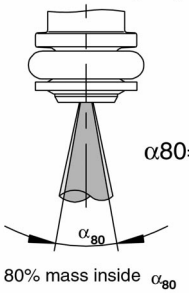
Order numbers	Design	Type	Flow rate at 3 bar (N-Heptan)	Spray angle α	Impedance
B 280 431 126	Standard	C	261,2 g/min	25°	12 Ω
B 280 431 127	Standard	C	261,2 g/min	70°	12 Ω
0 280 155 737	Long	C	261,2 g/min	15°	12 Ω
B 280 431 128	Standard	C	364,3 g/min	25°	12 Ω
B 280 431 129	Standard	C	364,3 g/min	70°	12 Ω
B 280 431 130	Standard	C	493,1 g/min	25°	1,2 Ω
B 280 431 131	Standard	C	493,1 g/min	70°	1,2 Ω
0 280 156 012	Standard	C	310,1 g/min	20°	12 Ω

Further injection valves on request

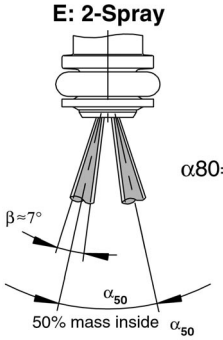
B: Pencil Beam



C: Conical Spray

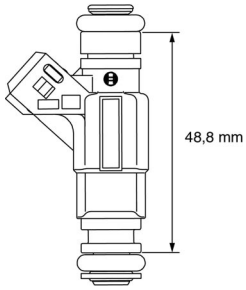


E: 2-Spray

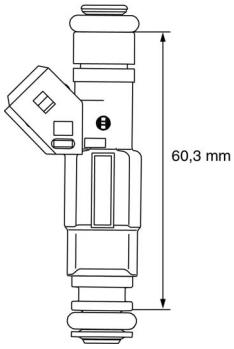


70% mass of single spray inside β

standard

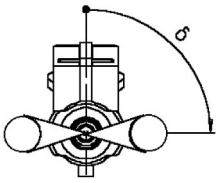


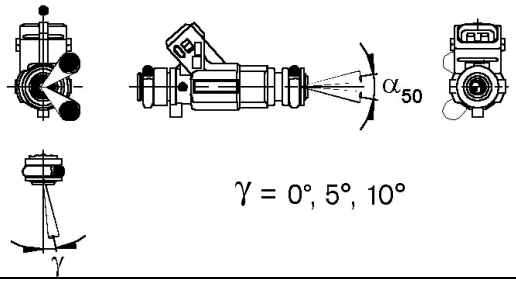
long



Angel between connection and spray level (δ = delta):
(only 2-spray preparation)

δ = 0°- 360° possible





γ = 0°, 5°, 10°

Injection Valve EV 12

The EV 12 injector is a development based on the EV 6. Its main feature is the fact that the position of its injection point can be varied. Compared with the EV 6, the EV 12 injection point can be moved forward up to 20 mm.

Mechanical data	
System pressure	max. 8 bar
Weight	40 g

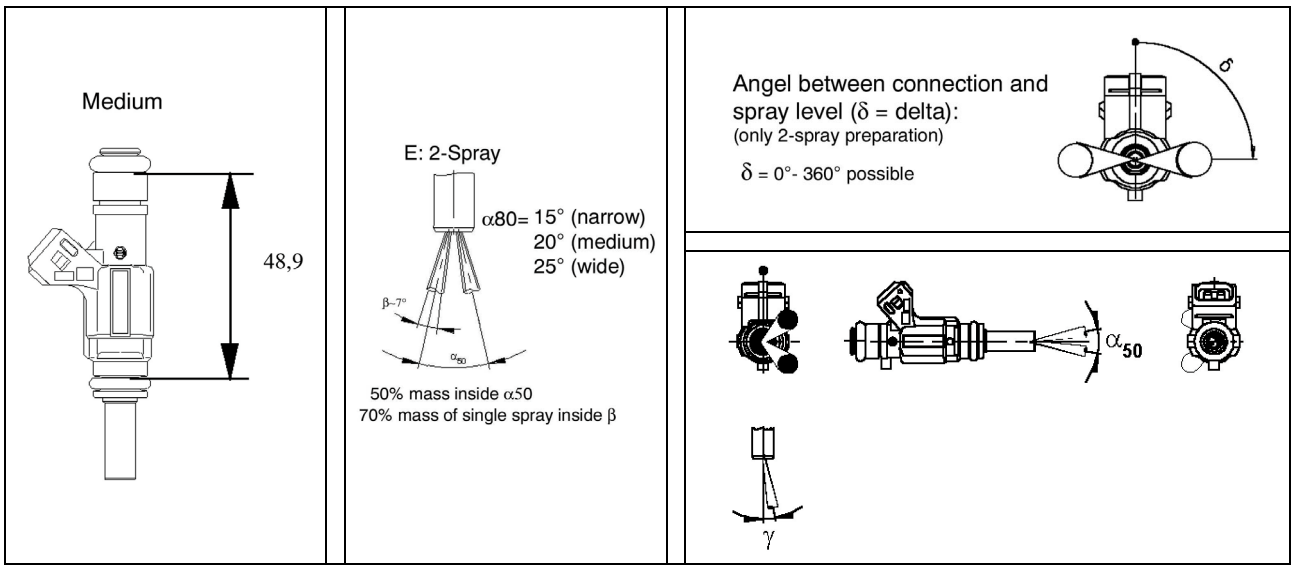
Electronic data	
Solenoid resistance	e.g 12 Ω
Max. power supply	16 V

Conditions for use	
Fuel input	axial (top-feed)
Operating temperatures	-40 ... 110°C
Permissible fuel temperatures	≤ 70°C
Climate proofness corresponds to saline fog test DIN 53 167	

Technical data

Order numbers	Design	Type	Flow rate at 3 bar (N-Heptan)	Spray angle α	β	γ	δ	Impedance
B 280 432 115	Medium	E	217 g/min	15°	15°	10°	270°	12 Ω
0 280 155 893	Medium	E	269 g/min	15°	7°	10°	270°	12 Ω
0 280 155 897	Medium	E	217 g/min	15°	7°	10°	270°	12 Ω

Further special versions on request



Injection Valve EV 14

The EV 14 injector is a further development based on the EV 6. It is even more compact, what allows its integration into the fuel rail.

In addition, this injector is also available with a variety of installation lengths, what makes an individual adaptation to the intake manifold possible.

Mechanical data	
System pressure	max. 8 bar
Weight	25 g
Spray angle	25° or 70°

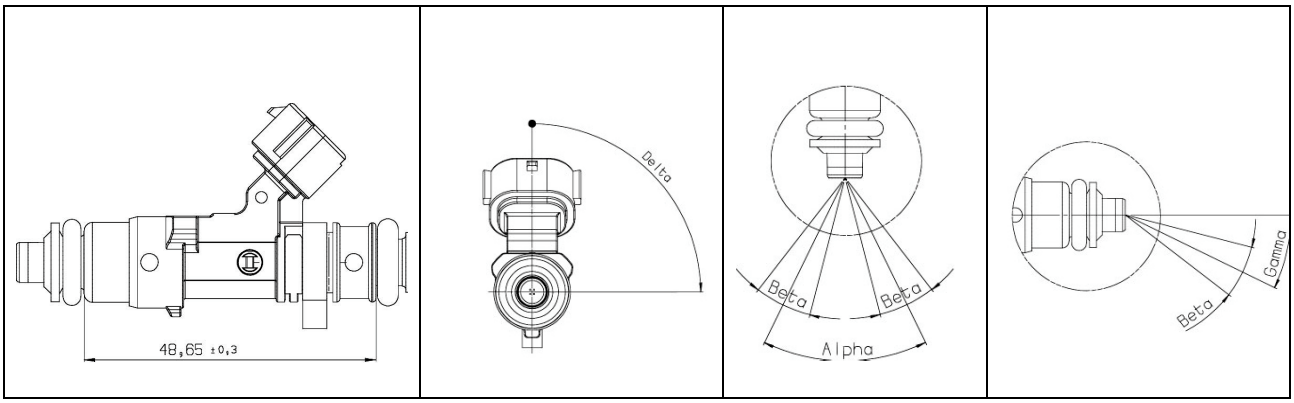
Electronic data	
Solenoid resistance	e.g 12 Ω
Max. power supply	16 V

Conditions for use	
Fuel input	axial (top-feed)
Operating temperatures	-40 ... 110°C
Permissible fuel temperatures	≤ 70°C
Installation lengths	48,65 mm
Climate proofness corresponds to saline fog test DIN 50 021	

Technical data

Order numbers	Design	Type	Flow rate at 3 bar (N-Heptan)	Spray angle α	Impedance
B 280 436 038/4	Standard	C	387,3 g/min	25°	12 Ω
B 280 436 038/2	Standard	C	503,5 g/min	25°	12 Ω
B 280 436 038/3	Standard	C	387,3 g/min	70°	12 Ω
B 280 436 038/1	Standard	C	503,5 g/min	70°	12 Ω

Further special versions on request



Ignition Coils

Single Fire Coil M

This ignition coil is specially designed for motorsport use. The electronic design connects high energy output with a small housing. The coil is available in a DR-25 sleeve with different options of connectors.

Electronic data	
High voltage	35 kV
I prim. (stand.)	10 A
Inductivity (prim.)	1,8 mH
Inductivity (sec.)	4,7 H
Resistance (prim.)	0,5 Ω
Resistance (sec.)	4,4 kΩ
Spark energy	33 mJ/10 A
U prim. (clamp.)	500 V
Voltage gradient	3,3 kV/µs

Mechanical data	
Weight	180 g
Vibration	80 g/5 ... 250 Hz

Conditions for use	
Temperature range	-20 ... 130°C

Order number	
	B 261 209 192
Offer drawing	**A 261 209 192**

Dwell time (ms)

Ubatt	4 A	6 A	8 A	10 A
8 V	1,30	2,40	3,20	4,20
10 V	1,00	1,60	2,40	3,40
12 V	0,80	1,25	1,80	2,40
14 V	0,65	1,05	1,40	1,80
16 V	0,55	0,85	1,18	1,46

Single Fire Coil P

This coil is low cost concept for cylinder head installation.

Electronic data	
High voltage	35 kV
I prim. (stand.)	8,5 A
Inductivity (prim.)	2,8 mH
Inductivity (sec.)	16 H
Resistance (prim.)	0,37 Ω
Resistance (sec.)	8,8 kΩ
Spark energy	45 ... 55 mJ
U prim. (clamp.)	260 V
Voltage gradient	1,6 kV/µs

Connector	
Cable harness connector	**1 928 402 868**

Mechanical data	
Weight	260 g
Vibration	40 g/5 Hz ... 2 kHz

Conditions for use	
Temperature range	-40 ... 140°C

Order number	
	B 261 208 315
Offer drawing	**A 221 152 139**

Dwell time (ms)					
Ubatt	**4 A**	**5 A**	**6 A**	**7 A**	**8 A**
8 V	2,90	4,00	5,50	7,80	
10 V	2,00	2,70	3,50	4,40	5,20
12 V	1,65	2,10	2,65	3,17	3,52
14 V	1,35	1,75	2,15	2,55	2,90
16 V	1,10	1,40	1,75	2,05	2,35

Single Fire Coil S

This ignition coil is specially designed for cylinder head mounting. The electronic design connects high energy output with a small housing. It is available in a DR-25 sleeve with different options of connectors.

Mechanical data	
Weight	148 g
Vibration	80 g/5 Hz ... 2,5 kHz
Diameter	22 mm

Conditions for use	
Temperature range	-40 ... 140°C

Dwell time	(Temperature of IC ca. 50°C)
Ubatt	**12,5 A**
8 V	3350 µs
10 V	1750 µs
12 V	1250 µs
14 V	960 µs
16 V	800 µs

Electronic data	
High voltage	>30 kV
I prim. (stand.)	12 A
Resistance (prim.)	0,2 Ω
Spark energy	33 … 40 mJ
U prim. (clamp.)	390 V
Voltage gradient	3,3 kV/µs

Order number	
	B 221 141 821-01
Offer drawing	**A 221 141 821-01**

Double Fire Coil 2x2

2 x 2 Sparks

This dual spark ignition coil is designed for low-cost applications in 4-cylinder engines.

Mechanical data	
Weight	900 g
Vibration	20 g/5 ... 250 Hz

Conditions for use	
Temperature range	-20 ... 120°C

Primary connector	
Offer drawing	**1 284 485 112**

Electronic data	
High voltage	33 kV
I prim. (stand.)	7,5 A
Inductivity (prim.)	3,7 mH
Inductivity (sec.)	38 H
Resistance (prim.)	0,5 Ω
Resistance (sec.)	13,3 kΩ
Spark energy	70 mJ
U prim. (clamp.)	320 V
Voltage gradient	1,1 kV/µs

Order number	
	0 221 503 407
Offer drawing	**A 221 151 089**

Dwell time (ms)

Ubatt	5 A	6 A	8 A
8 V	6,0	8,5	12,0
10 V	3,8	4,9	7,0
12 V	2,8	3,5	5,0
14 V	2,3	2,8	3,9
16 V	2,0	2,4	3,0

Double Fire Coil 3x2

3 x 2 Sparks

This dual spark ignition coil is designed for low-cost applications in 6-cylinder engines.

Mechanical data	
Weight	1300 g
Vibration	20 g/5 ... 250 Hz

Conditions for use	
Temperature range	-20 ... 120°C

Primary connector	
Offer drawing	**1 284 485 118**

Electronic data	
High voltage	33 kV
I prim. (stand.)	7,5 A
Inductivity (prim.)	3,7 mH
Inductivity (sec.)	38 H
Resistance (prim.)	0,5 Ω
Resistance (sec.)	13,3 kΩ
Spark energy	70 mJ
U prim. (clamp.)	320 V
Voltage gradient	1,1 kV/µs

Order number	
	0 221 503 002
Offer drawing	**A 221 151 810-006**

Dwell time (ms)			
Ubatt	**5 A**	**6 A**	**8 A**
8 V	6,0	8,5	12,0
10 V	3,8	4,9	7,0
12 V	2,8	3,5	5,0
14 V	2,3	2,8	3,9
16 V	2,0	2,4	3,0

Spark Plugs

Spark Plugs

The engines of competition vehicles are exposed to high thermal stress because of running them at full load most of the time.

Spark plugs for this operating conditions often have precious metal center electrodes (platinum, silver) and a short insulator base. This causes a very small heat absorption and a good heat derivation through the center electrode.

Corresponding to the various field of operations we manufacture over 1400 different types of spark plugs in production. You can get these standard spark plugs from your local Bosch-service and most spare parts dealers. The range of products includes versions with various seats and threads, thread lengths and electrode positions, the design parts air-gap, surface-gap and surface-air-gap types. You can choose between versions with one to four ground electrodes, the center electrode can be made from various materials.

Moreover we offer special versions and small batches which you should not hesitate asking for.

Fuel Pumps

Fuel Pump FP 100

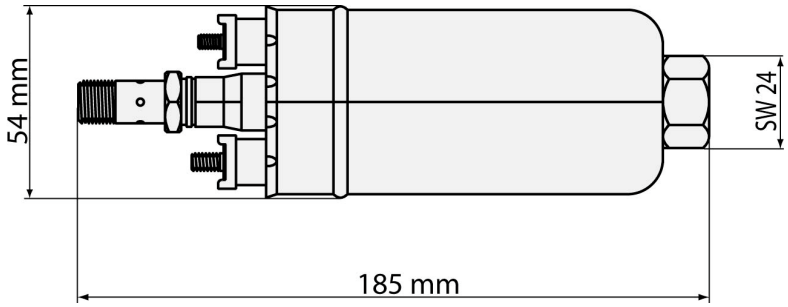
Fuel delivery: > 100 l/h, 5 bar

Description	
Fuel delivery	> 100 l/h
High temperature reduction	30 l/h
Supply voltage	13,5 V
Current consumption	5 A (5 bar)
Weight	725 g
Non return valve	external

Connections	
Intake side	M16 x 1,5
Pressure side	M12 x 1,5
Electrical	+: M4 / -: M5

Accessories
Primary connector

Order number	
	Y 580 700 118
Offer drawing	**Y 580 700 118**



Fuel Pump FP 165

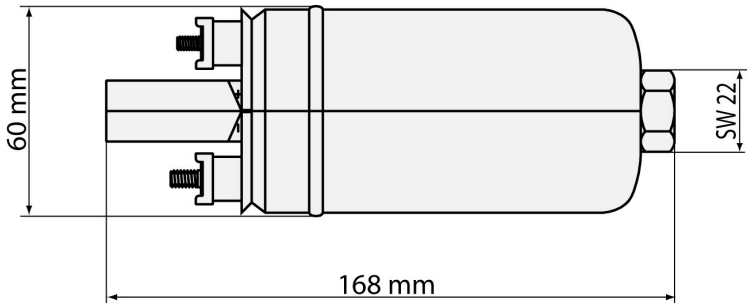
Fuel delivery: > 165 l/h, 5 bar

Description	
Fuel delivery	> 165 l/h
High temperature reduction	30 l/h
Supply voltage	13,5 V
Current consumption	10 A (5 bar)
Weight	980 g
Non return valve	internal

Accessories
Primary connector

Order number	
	0 580 254 979
Offer drawing	**A 580 152 325**

Connections	
Intake side	M16 x 1,5
Pressure side	M12 x 1,5
Electrical	+: M4 / -: M5



Fuel Pump FP 200

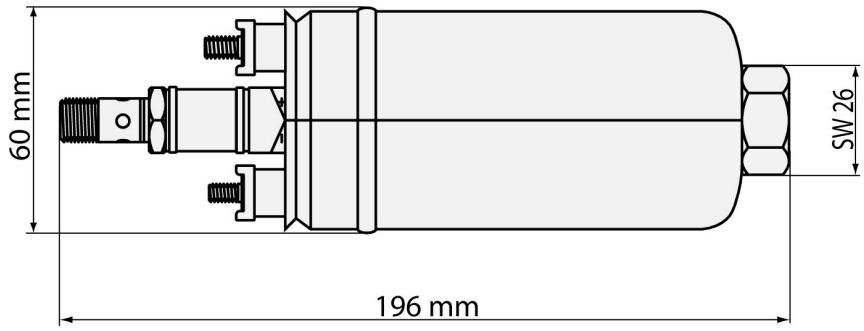
Fuel delivery: >200 l/h, 5/8 bar after a break-in period of 20 h

Description	
Fuel delivery	> 200 l/h
High temperature reduction	30 l/h
Supply voltage	13,5 V
Current consumption	13 A
Weight	1030 g
Non return valve	external

Connections	
Intake side	M18 x 1,5
Pressure side	M12 x 1,5
Electrical	+: M6 / -: M5

Accessories
Primary connector

Order numbers	
5 bar	**0 580 254 044**
8 bar	**B 261 205 413**
Offer drawing	**A 580 152 519**



Fuel Pressure Regulators

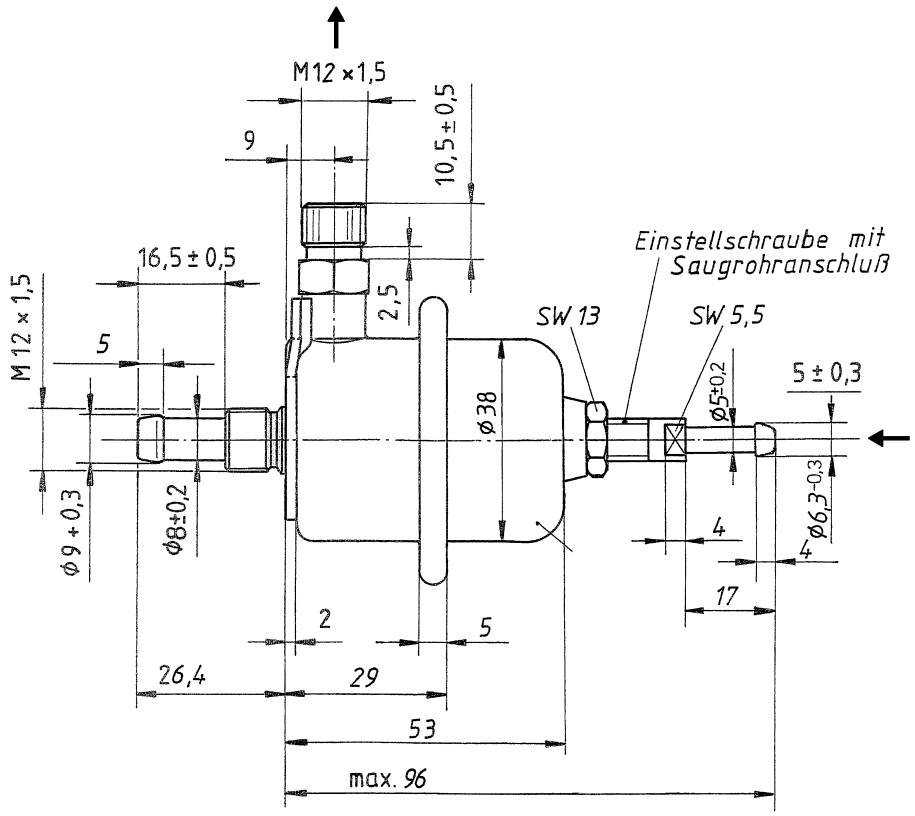
Fuel Pressure Regulator 34

Pressure range: 3,4 bar

Mechanical data	
Supply	M12 x 1,5
Reflow	8 mm, tube connector

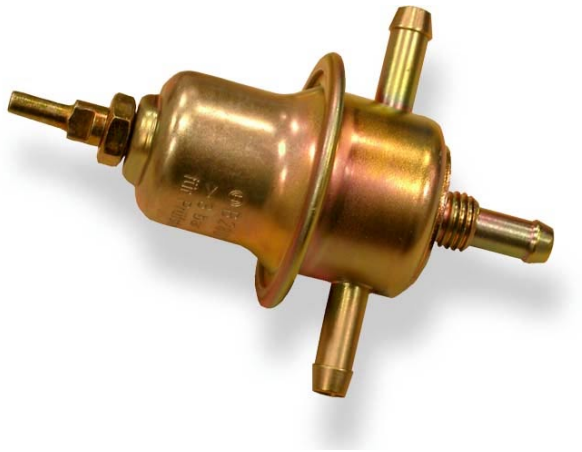
Order number	
	B 280 500 740
Offer drawing	**A 280 500 740**

Description
Sheet steel housing with manifold connection



Fuel Pressure Regulator 05-40 A

Pressure range: 0,5 … 4 bar



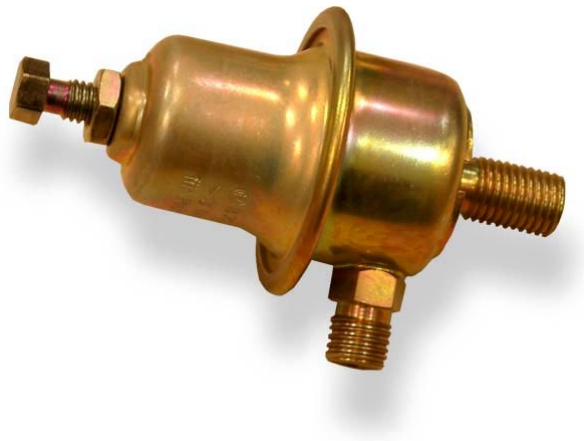
Mechanical data	
Supply	8 mm, tube connector
Reflow	8 mm, tube connector
Reflow quantity	min. 15 l/h, max. 220 l/h

Order number	
	B 280 500 139
Offer drawing	**A 280 500 104**

Description
Sheet steel housing with manifold connection

Fuel Pressure Regulator 05-40 B

Pressure range: 0,5 … 4 bar



Mechanical data	
Supply	M12 x 1,5
Reflow	M12 x 1,5

Order number	
	B 280 500 168
Offer drawing	**A 280 500 168**

Description
Sheet steel housing with manifold connection

Fuel Pressure Regulator 14 x 60

Pressure range: 1,4 … 5 bar/3,2 … 6 bar

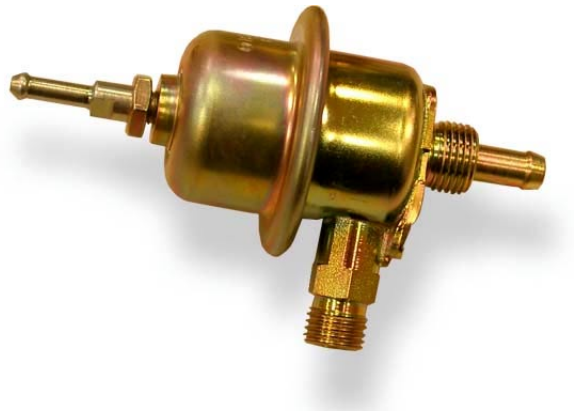
Mechanical data	
Supply	10 mm, O-ring
Reflow	8 mm, tube connector
Reflow quantity	min. 15 l/h, max. 220 l/h

Order numbers	
1,4 … 5 bar	**B 280 500 701**
3,2 … 6 bar	**B 280 500 581**
Offer drawing	**A 280 500 581**

Description
Sheet steel housing with manifold connection

Fuel Pressure Regulator 15-50

Pressure range: 1,5 … 5 bar



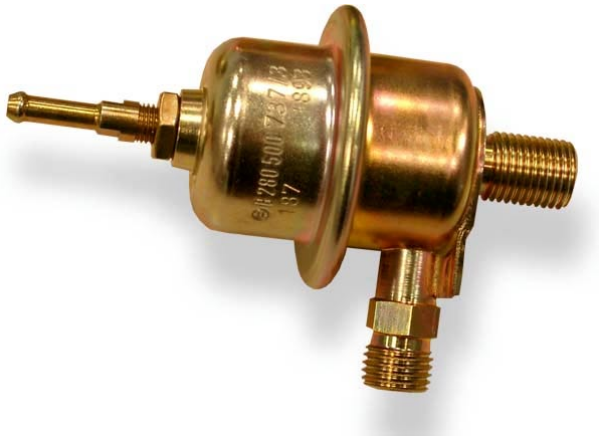
Mechanical data	
Supply	8 mm, O-ring
Reflow	M14 x 1,5
Reflow quantity	min. 15 l/h, max. 220 l/h

Order number	
	B 280 500 743
Offer drawing	**A 280 500 743**

Description
Sheet steel housing with manifold connection

Fuel Pressure Regulator 19-50

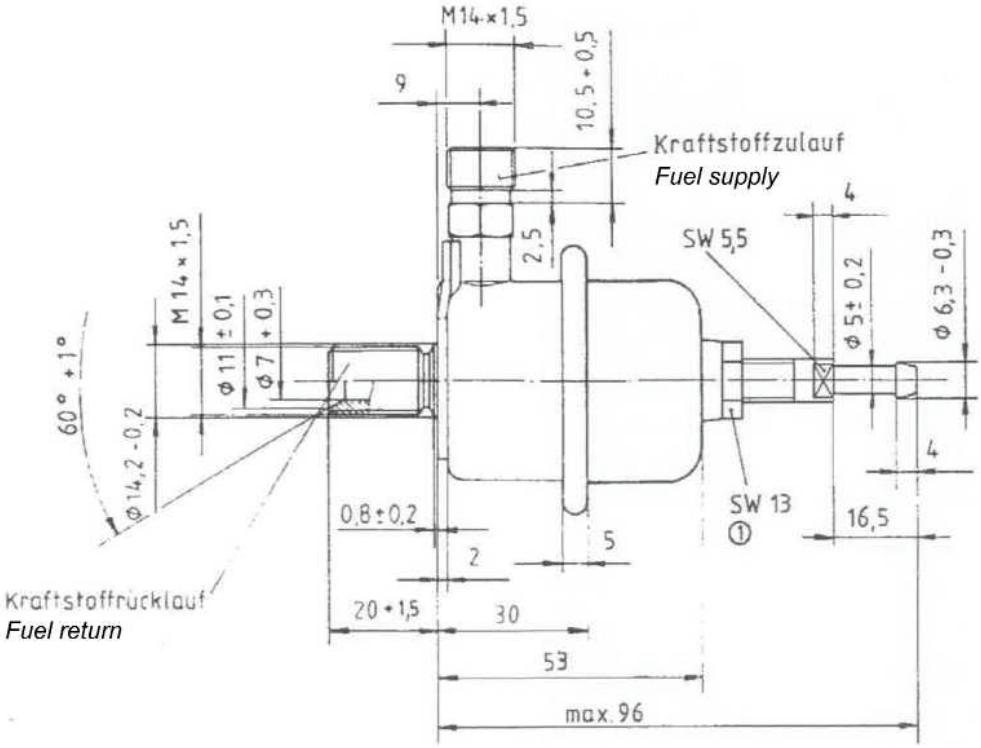
Pressure range: 1,9 … 5 bar



Mechanical data	
Supply	M14 x 1,5
Reflow	M14 x 1,5
Reflow quantity	min. 15 l/h, max. 220 l/h

Order number	
	B 280 500 737
Offer drawing	**A 280 500 662**

Description
Sheet steel housing with manifold connection



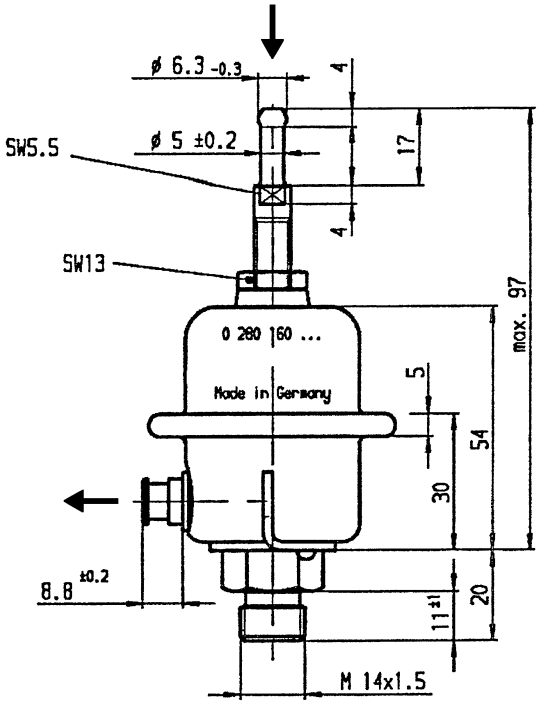
Fuel Pressure Regulator 20-50

Pressure range: 2 … 5 bar

Mechanical data	
Supply	10 mm, O-ring
Reflow	M14 x 1,5
Reflow quantity	min. 15 l/h, max. 220 l/h

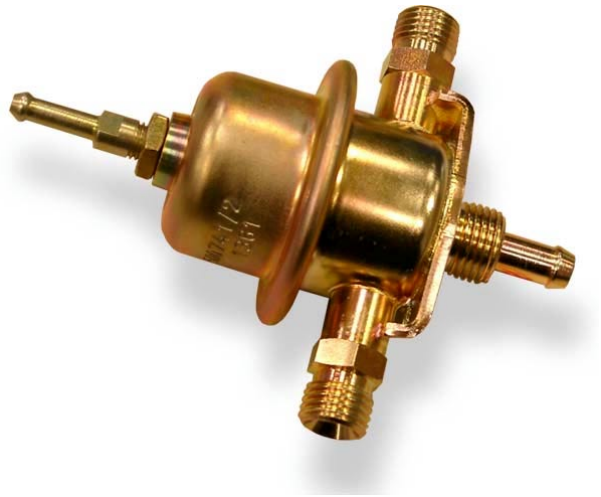
Order number	
	B 280 500 799
Offer drawing	**A 280 500 799**

Description
Sheet steel housing with manifold connection



Fuel Pressure Regulator 20x120

Pressure ranges: 2 … 5 bar/ 3 … 6 bar/ 4,5 … 12 bar



Mechanical data	
Supply	2 x M14 x 1,5
Reflow	8 mm, tube connector
Reflow quantity	min. 15 l/h, max. 220 l/h

Order numbers	
2 … 5 bar	**B 280 500 741**
3 … 6 bar	**B 280 500 714**
4,5 … 12 bar	**B 280 500 566**
Offer drawing	**A 280 500 714**

Description
Sheet steel housing with manifold connection

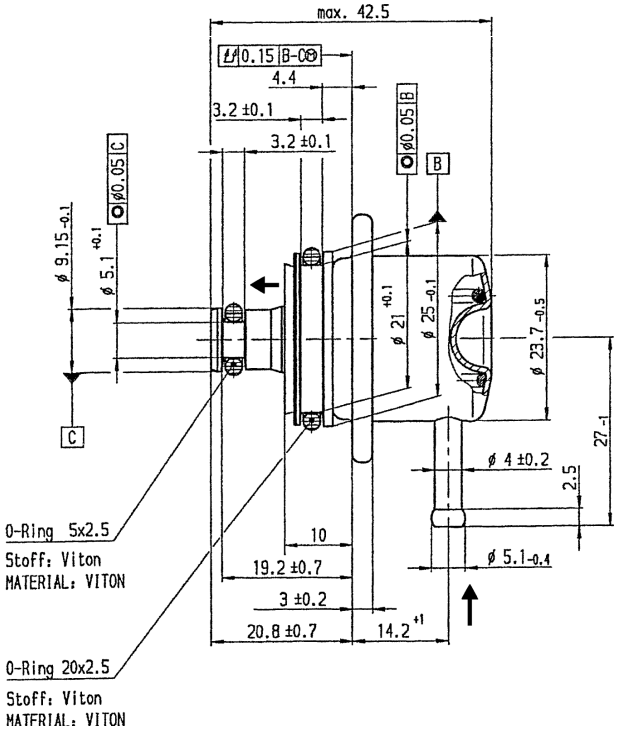
Fuel Pressure Regulator Mini 38

Pressure range: 3,8 bar

Mechanical data	
Set pressure	380 kPa
Set pressure accuracy	2 %
Linearity	1 %
External leak	no fuel leakage at 500 kPa
Bust pressure	> 1500 kPa

Conditions for use	
Temperature range	-40 … 120° C
Vibration	< 600 m/s^2
Weight	45 g

Order number	
	0 280 160 616
Offer drawing	**A 280 160 616**



Erledigung durch Kunden
Effect by customer

- O-Ringe leicht mit sauberem Motorenöl einölen
  Oil O-rings lightly with clean engine oil
- Nach der Montage an Kraftstoffzuteiler ist Dichtheitsprüfung durchzuführen
  Leaktest after installation
- Bei Ausbau und Wiederverwendung des Druckreglers müssen die O-Ringe überprüft werden
  When the pressure regulator is removed and will be reused, the O-rings must be checked
- Betrieb des Druckreglers mit Luft ist unzulässig
  Operation with air is not allowed

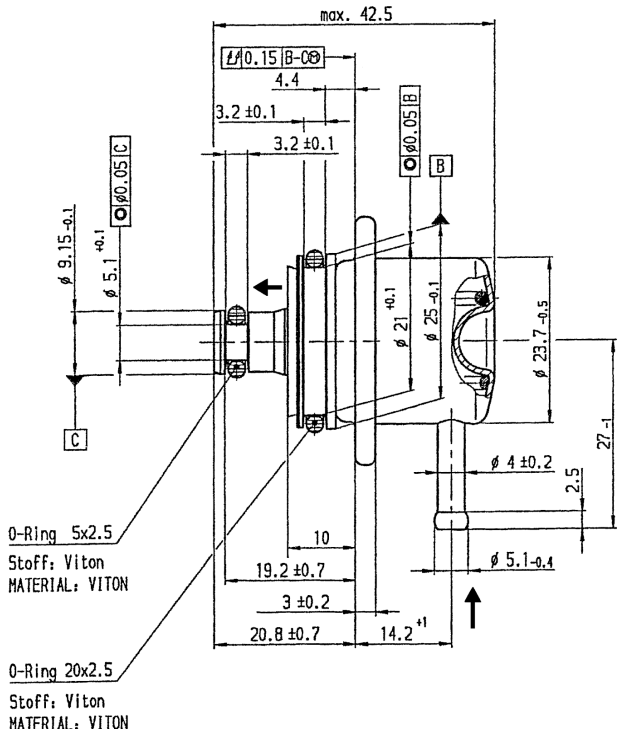
Fuel Pressure Regulator Mini 50

Pressure range: 5,0 bar

Mechanical data	
Supply	4 mm, tube connector
Reflow	9,15 mm, O-ring

Description
Sheet steel housing with manifold connection

Order number	
	B 280 550 113
Offer drawing	**A 280 550 058**



Erledigung durch Kunden
Effect by customer

- O-Ringe leicht mit sauberem Motorenöl einölen
  Oil O-rings lightly with clean engine oil
- Nach der Montage an Kraftstoffzuteiler ist Dichtheitsprüfung durchzuführen
  Leaktest after installation
- Bei Ausbau und Wiederverwendung des Druckreglers müssen die O-Ringe überprüft werden
  When the pressure regulator is removed and will be reused, the O-rings must be checked
- Betrieb des Druckreglers mit Luft ist unzulässig
  Operation with air is not allowed

Fuel Pressure Regulator Mini A

Pressure ranges: 2,2 … 3,5 bar/3,5 … 5 bar

Mechanical data	
Supply	24,6 mm, O-ring
Reflow	9,15 mm, O-ring
Reflow quantity	min. 15 l/h, max. 220 l/h

Description
Light weight aluminium housing
No manifold connection

Accessories	
Pre-filter	1 287 431 008

Order numbers	
2,2 … 3,5 bar	**B 280 550 340**
3,5 … 5 bar	**B 280 550 341**
Offer drawing	**A 280 550 340**

Erledigung durch Kunden
Effect by customer

- O-Ringe leicht mit sauberem Motorenöl einölen
  Oil O-rings lightly with clean engine oil
- Nach der Montage an Kraftstoffzuteiler ist Dichtheitsprüfung durchzuführen
  Leaktest after installation
- Bei Ausbau und Wiederverwendung des Druckreglers müssen die O-Ringe überprüft werden
  When the pressure regulator is removed and will be reused, the O-rings must be checked
- Betrieb des Druckreglers mit Luft ist unzulässig
  Operation with air is not allowed

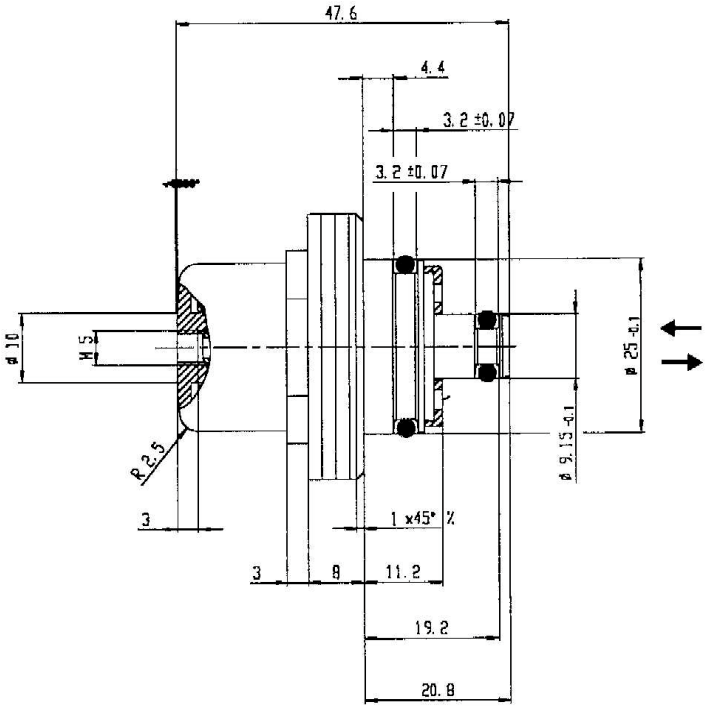
Fuel Pressure Regulator Mini

Pressure range: 6/8/10 bar

Mechanical data	
Supply	25 mm, O-ring
Reflow	9,15 mm, O-ring
Reflow quantity	min. 30 l/h, max. 400 l/h

Order numbers	
6 bar	**B 261 208 106**
8 bar	**B 261 208 108**
10 bar	**B 261 208 109**
Offer drawing	**A 261 208 101**

Description
Light weight aluminium housing
No manifold connection



Erledigung durch Kunden
Effect by customer

- O-Ringe leicht mit sauberem Motorenöl einölen
  Oil O-rings lightly with clean engine oil
- Nach der Montage an Kraftstoffzuteiler ist Dichtheitsprüfung durchzuführen
  Leaktest after installation
- Bei Ausbau und Wiederverwendung des Druckreglers müssen die O-Ringe überprüft werden
  When the pressure regulator is removed and will be reused, the O-rings must be checked
- Betrieb des Druckreglers mit Luft ist unzulässig
  Operation with air is not allowed

Starters

Starter 1,4 kW

This starter is specially constructed for motorsport demand. It is a pre-engaged drive starter in clockwise version.

Mechanical data	
Weight	3200 g
Revolutions	3600 x 1/min
Modul	2/11

Conditions for use	
Max. temperature	150°C
Vibration	high protection

Electrical data	
Performance	1,4 kW
Max. current	300 A

Order number	
	B 261 206 115
Offer drawing	**A 001 111 036**

Starter 1,7 kW

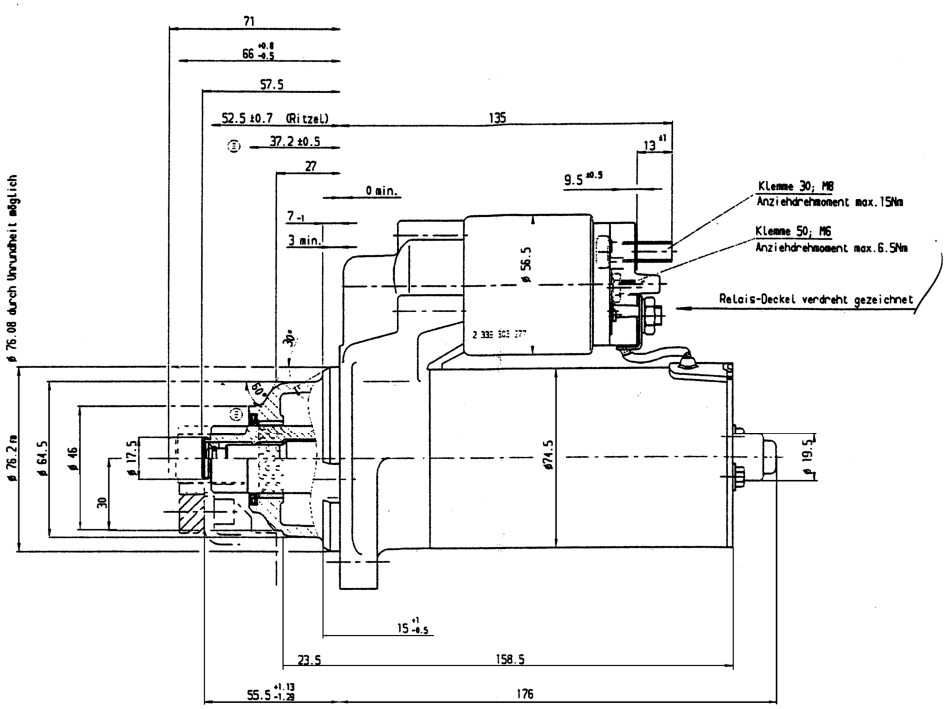
This starter is specially constructed for motorsport demand. It is a pre-engaged drive starter, we offer it in clockwise and anticlockwise version on request.

Mechanical data	
Weight	3700 g
Revolutions	3600 x 1/min
Transmission ratio	i 5,0
Modul	2/11

Conditions for use	
Max. temperature	150°C
Vibration	high protection

Electrical data	
Performance	1,7 kW

Order number	
	B 261 208 186
Offer drawing	**A 261 208 186**



Alternators

Alternator 80 A

This alternator is modified for motorsport demand, splash protected and delivered without pulley and fan. Clockwise and anticlockwise versions are possible, modifications are available on request.

Mechanical data	
Case material	aluminium
Weight	3300 g
Dimensions	
Diameter	128 mm
Length without shaft stub	116 mm
Between mounting points	144 mm
Current regulator unit	integrated
Rotations	15 000 x 1/min

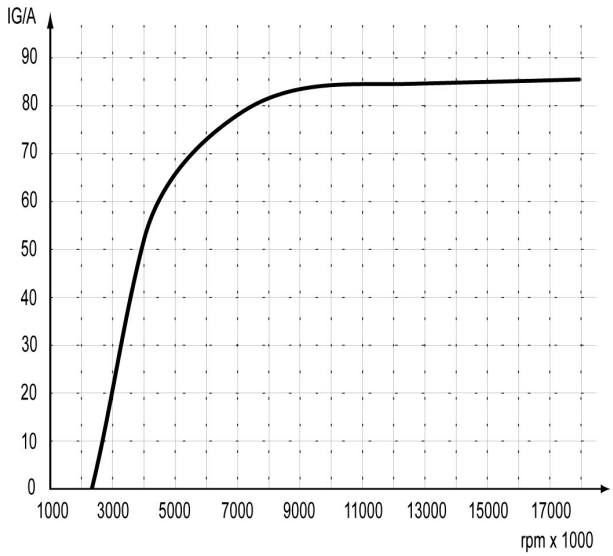
Conditions for use	
Temperature range	-10 … 90°C
Vibration	high protection
Installation without rubber mounting	

Electronic data	
Rated current	80 A
Supply voltage	13,5 V
Cut-in speed	2800 x 1/min
Coupling	screws

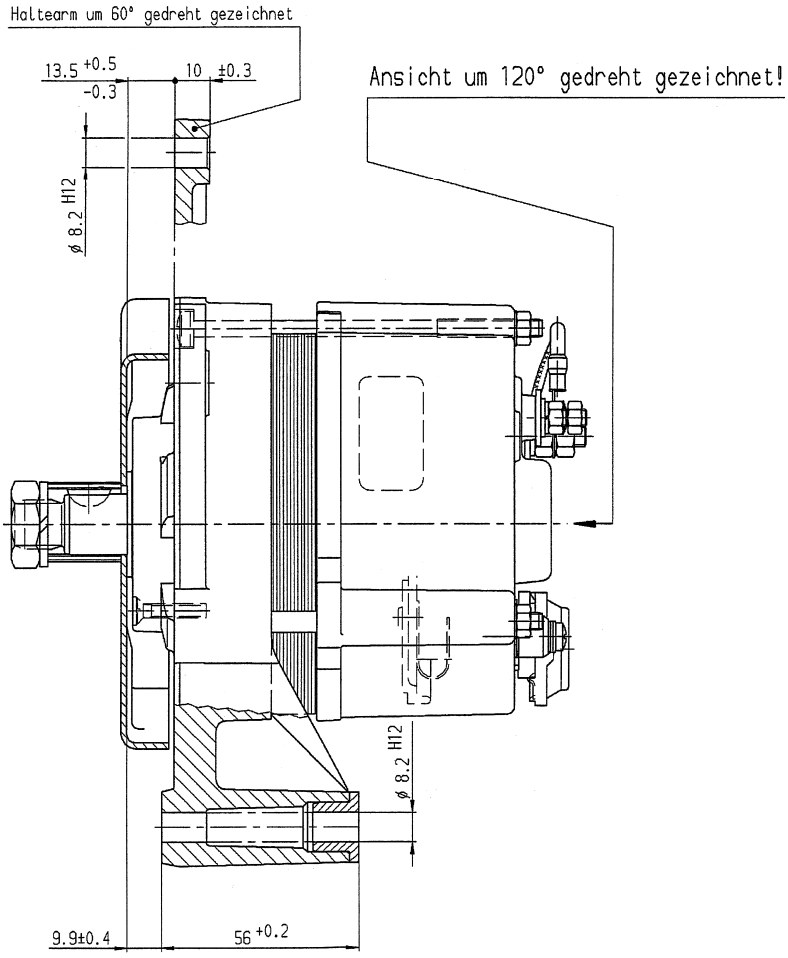
Order numbers	
Alternator	**B 120 300 023**
Pulley/fan anticlockwise	**B 261 205 903**
Pulley/fan clockwise	**C 120 934 602**
Offer drawing	**A 120 300 020**

Characteristic

Rpm	IG (A) 25°C
1000	0
2000	0
3000	18
4000	51
5000	66
6000	74
7000	81
8000	83
9000	84
10000	85
12000	85
15000	85
18000	85



Design



Alternator GC 100 A

This alternator is modified for motorsport demand and splash protected. Clockwise and anticlockwise versions are possible, modifications are available on request.

Mechanical data	
Case material	aluminium
Weight	4500 g
Dimensions	
Diameter	125 mm
Length without shaft stub	133 mm
Between mounting points	154 mm
Current regulator unit	integrated
Rotations	18 000 x 1/min

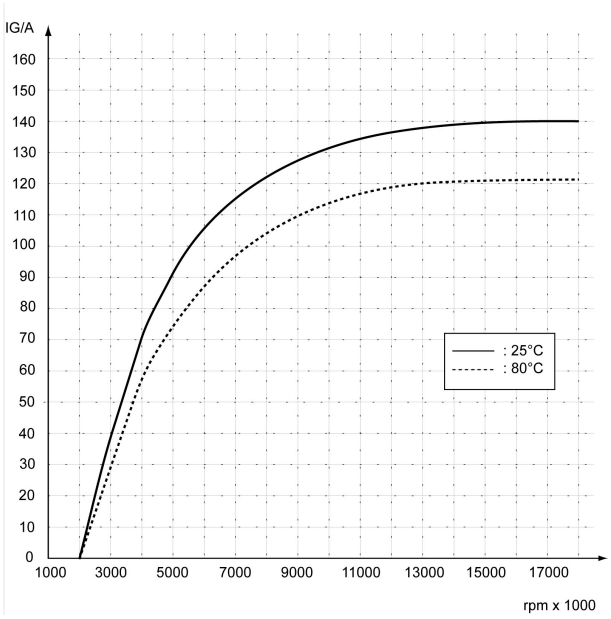
Conditions for use	
Temperature range	-10 … 90°C
Vibration	high protection
Installation without rubber mounting and in a well ventilated area	

Electronic data	
Rated current	100 A
Supply voltage	14 V
Cut-in speed	1500 x 1/min
Coupling	screws

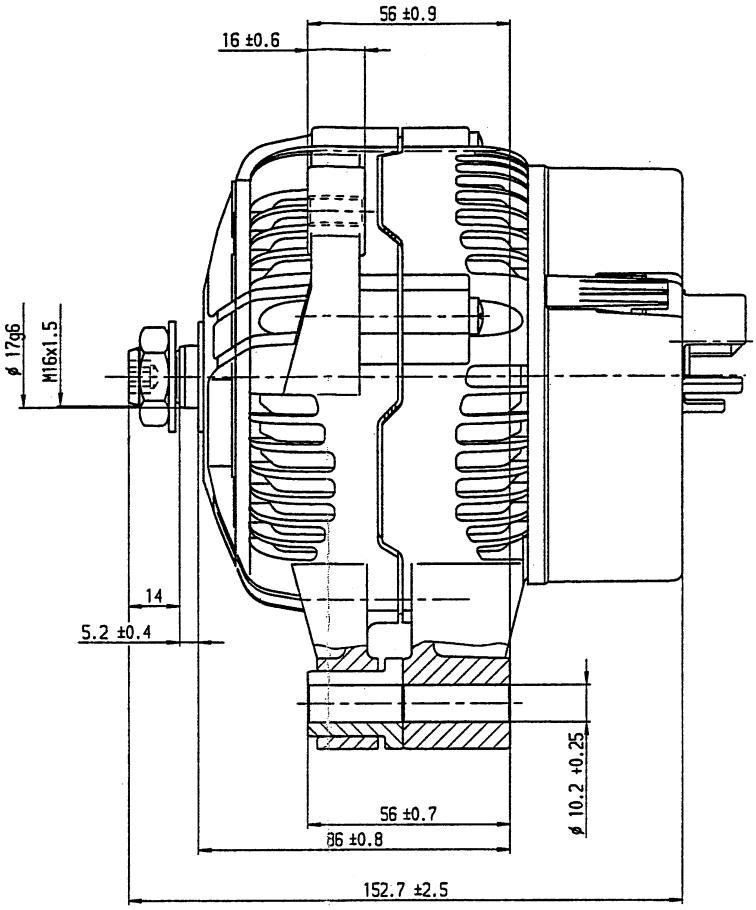
Order numbers	
Anticlockwise rotation	**B 120 310 176**
Clockwise rotation	**B 120 310 175**
Offer drawing	**A 120 310 175**

Characteristic

Rpm	IG (A) 25°C	IG (A) 80°C
1000	0,0	0,0
2000	57,1	41,5
3000	90,3	64,7
4000	106,6	71,7
5000	115,6	79,3
6000	121,0	82,9
7000	124,8	86,9
8000	127,2	89,5
9000	128,8	91,9
10000	129,9	93,1
12000	131,2	96,0
15000	132,7	99,9
18000	133,6	102,5



Design



Alternator GCB1 100 A

This alternator is modified for motorsport demand and splash protected. Clockwise and anticlockwise versions are possible, modifications are available on request.

Mechanical data	
Case material	aluminium
Weight	3400 g
Dimensions	
Diameter	121 mm
Length without shaft stub	128 mm
Between mounting points	154 mm
Current regulator unit	integrated
Rotations	18 000 x 1/min

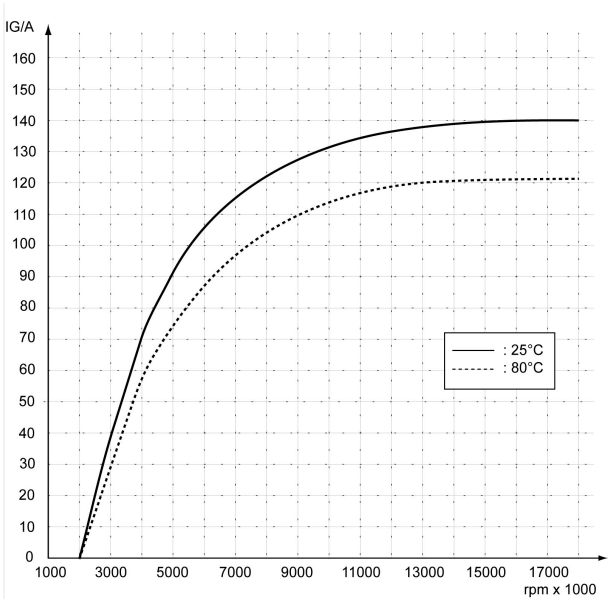
Conditions for use	
Temperature range	-30 … 90°C
Vibration	high protection
Installation without rubber mounting	

Electronic data	
Rated current	100 A
Supply voltage	13,5 V
Cut-in speed	3000 x 1/min
Coupling	screws

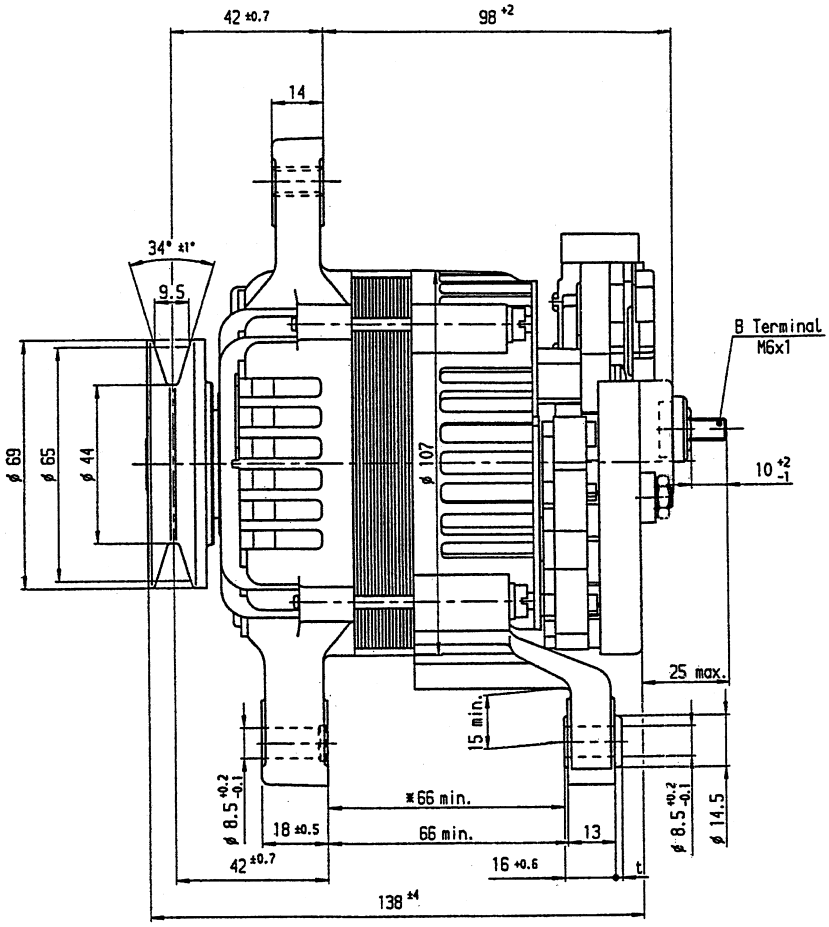
Order numbers	
Anticlockwise rotation	**B 120 316 142**
Clockwise rotation	**B 120 316 066**
Offer drawing	**A 120 316 066**

Characteristic

Rpm	IG (A) 25°C	IG (A) 80
1000	0	0
2000	0	0
3000	40	30
4000	73	60
5000	92	76
6000	107	88
7000	117	98
8000	123	106
9000	129	110
10000	132	113
12000	137	118
15000	140	121
18000	140	121



Design



Alternator GCB1 120 A

This alternator is modified for motorsport demand and splash protected. Clockwise and anticlockwise versions are possible, modifications are available on request.

Mechanical data	
Case material	aluminium
Weight	3400 g
Dimensions	
Diameter	121 mm
Length without shaft stub	128 mm
Between mounting points	154 mm
Current regulator unit	integrated
Rotations	18 000 x 1/min

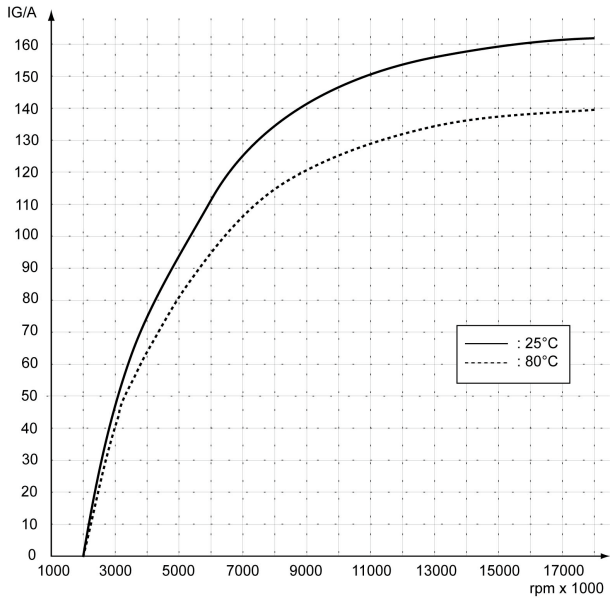
Conditions for use	
Temperature range	-30 … 90°C
Vibration	high protection
Installation without rubber mounting	

Electronic data	
Rated current	120 A
Supply voltage	13,5 V
Cut-in speed	3000 x 1/min
Coupling	screws

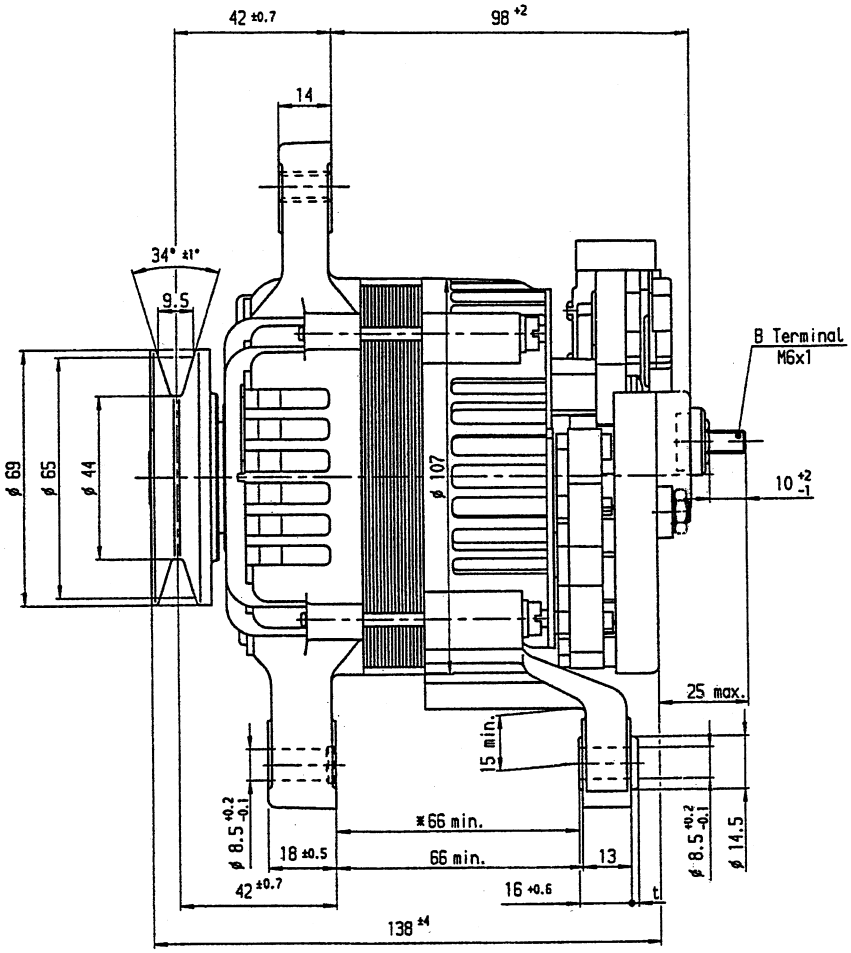
Order numbers	
Anticlockwise rotation	**B 261 208 597**
Clockwise rotation	**B 261 208 599**
Offer drawing	**A 120 316 066**

Characteristic

Rpm	IG (A) 25°C	IG (A) 80°C
1000	0	0
2000	0	0
3000	53	47
4000	72	64
5000	95	82
6000	112	95
7000	126	106
8000	135	116
9000	142	121
10000	147	126
12000	154	132
15000	158	138
18000	162	140

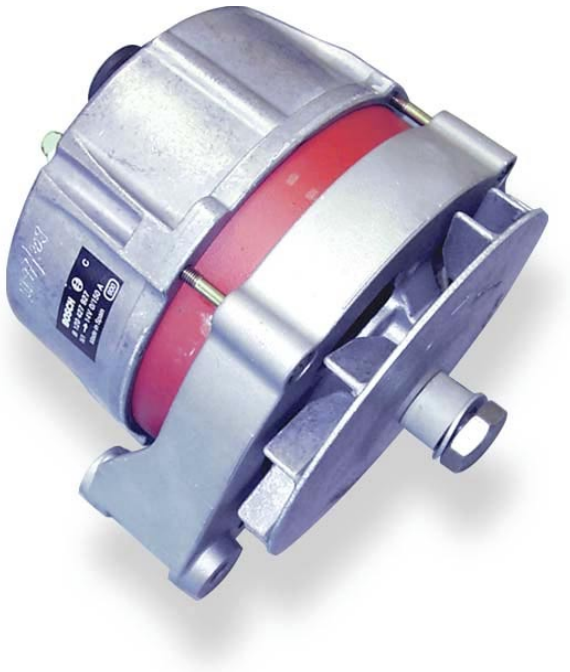


Design



Alternator 150 A

This alternator is modified for motorsport demand, splash protected and delivered without pulley and fan. Clockwise and anticlockwise versions are possible, modifications are available on request.



Mechanical data	
Case material	aluminium
Weight	5500 g
Dimensions	
Diameter	138 mm
Length without shaft stub	136 mm
Between mounting points	156 mm
Current regulator unit	integrated
Rotations	15 000 x 1/min

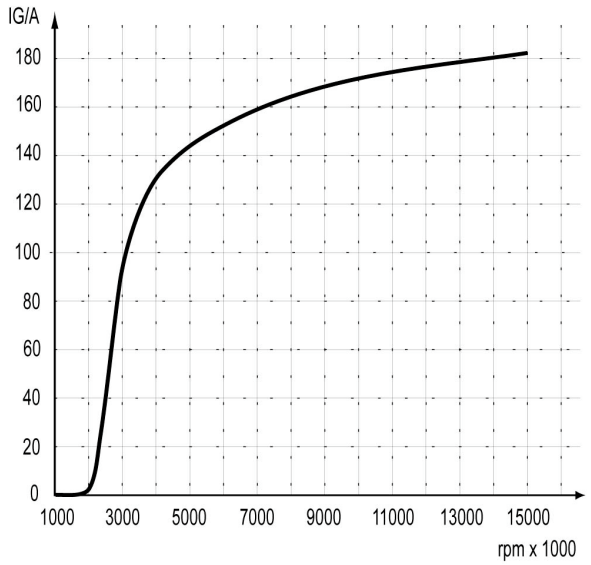
Conditions for use	
Temperature range	-10 … 90°C
Vibration	high protection
Installation without rubber mounting	

Electronic data	
Rated current	150 A
Supply voltage	13,5 V
Cut-in speed	1700 x 1/min
Coupling	screws

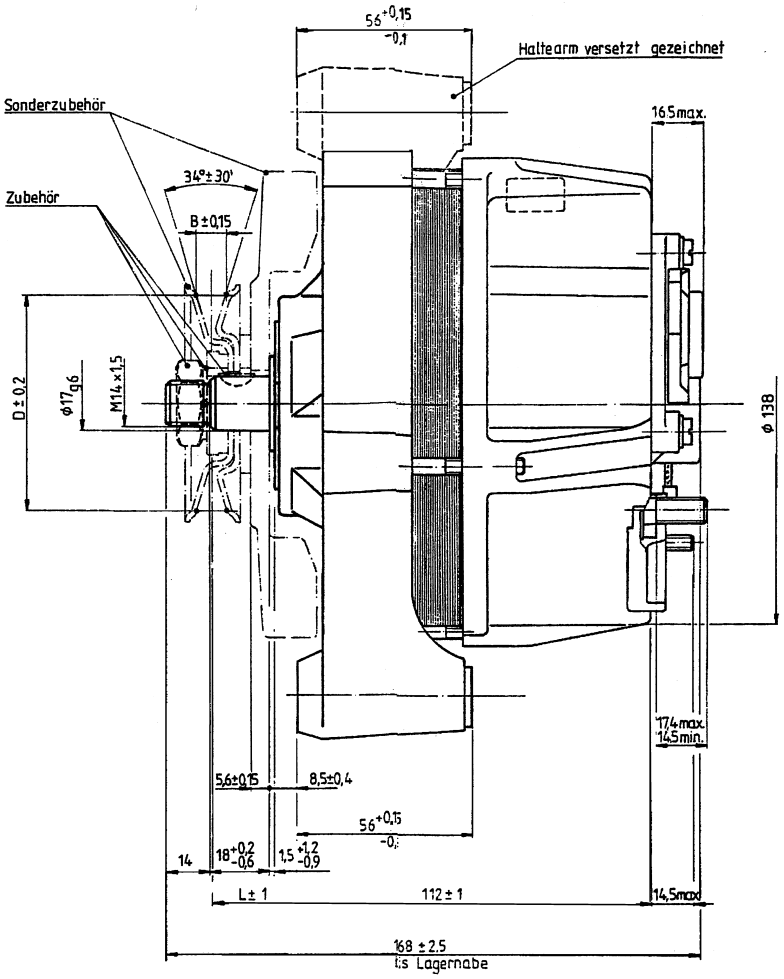
Order numbers	
Anticlockwise rotation	**B 120 427 927**
Pulley/fan anticlockwise	**C 120 932 020**
Pulley/fan clockwise	**B 261 205 905**
Offer drawing	**A 120 427 872**

Characteristic

rpm	IG (A) 25°C
1000	0
2000	8
3000	95
4000	129
5000	143
6000	153
7000	160
8000	164
9000	168
10000	173
12000	178
15000	183



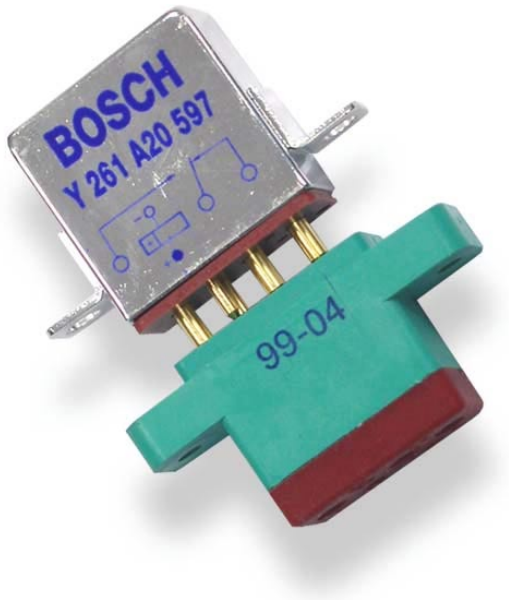
Design



Relay

Relay 25 A

A miniature DC-contactor for electrical power control. The rated current is 25 A for secondary power distribution with high inrush current like hydraulic- and fuel motor loads. The base part allows a quick change of the relay.



Mechanical data	
Drill hole	3,1 mm
Weight	61 g

Electronic data	
Supply voltage	12 ... 14,5 V
Max. current	25 A
Min. switches	20 000

Conditions for use	
Temperature range	-30 … 125°C
Vibration	30 g/70 Hz ... 3 kHz
Shock	100 g (11 ms)

Order numbers	
Relay	**Y 261 A20 597**
Offer drawing	**Y 261 A25 338**
Base	**Y 261 A20 598**
Offer drawing	**Y 261 A25 338**

Communication

Data Logging

CardMemory

The CardMemory is a device used for data acquisition. The basic model C5 is designed with a 5 pin connector, for data transfer via CAN. The extended model C40 Plus is developed to read in additional 15 analogous signals and 1 rev signal. The measured data are stored on a compact flash card.

Mechanical data	
Dust and splashwater proof aluminium housing	
Flexible housing fixation points	
Connector	with 5 or 40 pins
Size	150 x 90 x 22 mm
Weight	330 g

Conditions for use	
ECU temperature	-40 … 75°C
Max. power consumption	7 W at 14 V
Max. vibration	15 g sinus at 20 Hz … 2 kHz for t < 5 h

Electrical data
1 microcontroller with 16 bit organisation
1 CAN interface
Real time clock
Non volatile flash card memory
Total calculation capacity approximately 10 MIPS

Options	
15 analogous inputs with 10 bit resolution and 5 ms sample rate time	
1 inductive crankshaft sensor interface	
Sensor supply outputs	5 V/100 mA 10 V/100 mA
Calibration functions are realised with an additional software tool	

Necessary equipment	
Flash card 24 MB	**F 01E B01 101**
Flash card 48 MB	**F 01E B01 102**
Flash card 96 MB	**F 01E B01 103**
Memory adapter	**B 261 206 864**
C40 adapter cable	**B 261 209 433**

Connector	
Cable harness connector C5	**AS6-06-05SN HE**
Cable harness connector C40 Plus	**AS0-14-35 SN**

Order numbers	
C5	**B 261 206 858**
C40 Plus	**B 261 206 860**
Upgrade C5 to C40 Plus	**B 261 206 869**
Software chassis adjust	**B 261 206 870**

Electronic Sensor Interface Box ESIB

ESIB is a special device for measuring the signals of multiple sensors. The flexible use of microboards allows the adaptation to a great variety of measuring tasks.

For data recording the integrated CAN-bus can be linked to a Bosch Motronic or CardMemory.

Mechanical data	
Dust and water proof aluminium housing	
Filtered connectors of military design with high pin density (MIL-38999)	
Vibration damped printed circuit boards	
Flexible housing fixation points	
Size	120 x 114 x 38 mm
Weight	550 g

Electronic data
1 microcontroller with 16 bit organisation, calculation power 16 MIPS
0,5 MB RAM and up to 9 MB non-volatile flash RAM

Conditions for use	
ECU temperature	-40 … 85°C
Max. power consumption	7 W at 14 V
Max. vibration	30 g/20 Hz … 2 kHz for t < 5 h

Variations	
ESIB Basic	Flexible use of microboards
ESIB-Lam 8	Lambda measurement with 8 channels
ESIB-Lam 8S	Lambda measurement with 8 channels and further signals
ESIB-Thermo 8	Exhaust-gas temperature measurement with 8 channels
ESIB-Thermo 8S	Exhaust-gas temperature measurement with 8 channels and further signals
ESIB-Ana 16S	Measuring of 16 analog signals and 6 wheelspeed signals
ESIB-Ana 24	Measuring of 24 analog signals

ESIB Basic

Flexible use of microboards

Functionality
28 multifunctional input/output connector pins configured with insertion of function specific micro-boards
Max. 6 microboards
Data transfer via CAN for data logging or via K-Line for online measuring

Outputs
Serial CAN protocol to main ECU with 1 Mbps serial K-Line or RS232 up to 500 Kbps
8 PWM power stages with 2,0 A output current
Precise and independent 10 V and 5 V sensor supply available

Inputs
Depending on microboards used

Alternative microboards	
I8L:	8 ch analog input
I8H:	8 ch analog input (high resolution)
I6W:	6 ch wheel speed detection
L4M:	4 ch lambda measurement (LSM-type)
O4B:	4 ch universal output
I2D:	2 ch differential input
I4D:	4 ch differential input
I2T:	2 ch LVDT
E4T:	4 ch exhaust-gas temp.measurement

ESIB-Lam 8

Lambda measurement with 8 channels

Functionality
Lambda measuring with 8 wide range lambda sensors
Data transfer via CAN for data logging or via K-Line for online measuring

Outputs
Serial CAN protocol to main ECU with 1 Mbps serial K-Line or RS232 up to 500 Kbps
8 PWM power stages with 2,0 A output current
Precise and independent 10 V and 5 V sensor supply available

Inputs
8 channels wide band lambda measuring from λ 0,8 to 1,3

Integrated microboards
2 x L4M

Order number
B 261 208 228

ESIB-Lam 8S

Lambda measurement with 8 channels and further signals

Functionality
Lambda measuring with 8 wide range lambda sensors
Vehicle speed and track distance with inductive or hall effect speed sensor
Engine revolutions
Throttle position
Lap trigger signal
Lateral acceleration
5 analog inputs
Data transfer via CAN for data logging or via K-Line for online measuring

Inputs
8 channels wide band lambda measuring from λ 0,8 to 1,3
8 channels ADC 0 … 5 V
4 wheelspeed interfaces inductive or hall effect, free programmable

Integrated microboards
2 x L4M
1 x I8L
1 x 6W

Outputs
Serial CAN protocol to main ECU with 1 Mbps serial K-Line or RS232 up to 500 Kbps
8 PWM power stages with 2,0 A output current
Precise and independent 10 V and 5 V sensor supply available

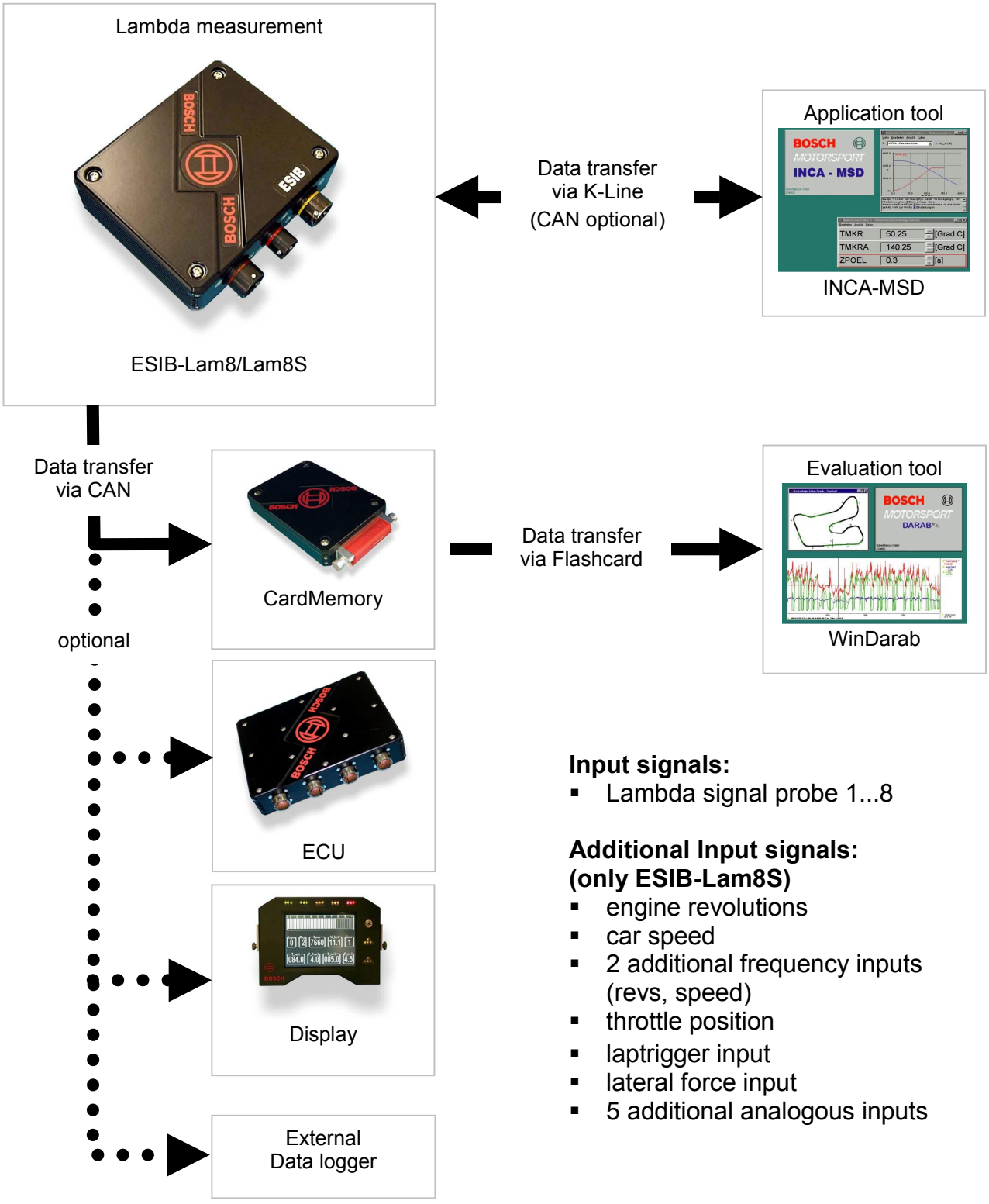
Order number
B 261 208 229

System Variations

	ESIB Lam8	ESIB Lam8S	Card Memory C5	KIC2 Interface	DDU2-Light	INCA Light	WinDarab Light incl. DCP	SoftDrive	
Variation 1 (Stand-alone basic variation)	●				●				**B 261 208 247**
Variation 2 (For use in combination with other systems)	●								**B 261 208 228**
Variation 3 (For engine dyno use and restricted car use)	●			●		●			**B 261 208 233**
Variation 4 (For car use)		●	●				●	●	**B 261 208 234**
Variation 5 (For engine dyno and car use)		●	●	●		●	●	●	**B 261 208 235**

ESIB-Lam8/Lam8S

System Overview



Input signals:

- Lambda signal probe 1...8

Additional Input signals:
(only ESIB-Lam8S)

- engine revolutions
- car speed
- 2 additional frequency inputs (revs, speed)
- throttle position
- laptrigger input
- lateral force input
- 5 additional analogous inputs

ESIB-Thermo 8

Exhaust-gas temperature measurement with 8 channels

Functionality
8 exhaust-gas temperatures
Data transfer via CAN for data logging or via K-Line for online measuring

Outputs
Serial CAN protocol to main ECU with 1 Mbps serial K-Line or RS232 up to 500 Kbps
8 PWM power stages with 2,0 A output current
Precise and independent 10 V and 5 V sensor supply available

Inputs
8 channels thermocouple probe sensor, Type K, DIN IEC 584

Integrated microboards
2 x E4T

Order number
B 261 208 261

ESIB-Thermo 8S

Exhaust-gas temperature measurement with 8 channels and further signals

Functionality
8 exhaust-gas temperatures
Vehicle speed and track distance with inductive or hall effect speed sensor
Engine revolutions
Throttle position
Lap trigger signal
Lateral acceleration
5 analog inputs
Data transfer via CAN for data logging or via K-Line for online measuring

Outputs
Serial CAN protocol to main ECU with 1 Mbps serial K-Line or RS232 up to 500 Kbps
8 PWM power stages with 2,0 A output current
Precise and independent 10 V and 5 V sensor supply available

Inputs
8 channels thermocouple probe sensor, Type K, DIN IEC 584
8 channels ADC 0 … 5 V
4 wheelspeed interfaces inductive or hall effect, free programmable

Integrated microboards
2 x E4T
1 x I8L
1 x 6W

Order number
B 261 208 262

ESIB-Ana 16S

Measuring of 16 analog signals and 6 wheelspeed signals

Functionality
16 multifunctional analog inputs
6 wheelspeed inputs
Data transfer via CAN for data logging or via K-Line for online measuring

Outputs
Serial CAN protocol to main ECU with 1 Mbps serial K-Line or RS232 up to 500 Kbps
8 PWM power stages with 2,0 A output current
Precise and independent 10 V and 5 V sensor supply available

Inputs
16 channels ADC 0 … 5 V
6 wheelspeed interfaces inductive or hall effect, free programmable

Integrated microboards
2 x I8L
1 x 6W

Order number
B 261 208 227

ESIB-Ana 24

Measuring of 24 analog signals

Functionality
24 multifunctional analog inputs
Data transfer via CAN for data logging or via K-Line for online measuring

Outputs
Serial CAN protocol to main ECU with 1 Mbps serial K-Line or RS232 up to 500 Kbps
8 PWM power stages with 2,0 A output current
Precise and independent 10 V and 5 V sensor supply available

Inputs
24 channels ADC 0 … 5 V

Integrated microboards
3 x I8L

Order number
B 261 208 226

Accessories

Compact flash cards, adapters and drivers are necessary to use the Card memory. For some optional functions additional cables and software are on offer.

Compact flash cards are offered with 24 MB, 48 MB and 96 MB storage capacity. The compact flash card adapter is used to insert the card to the PCMCIA slot of the PC for data download and card formatting. The SoftDrive software is used for the CAN card formatting and the data download to the PC via PCMCIA slot.

In conjunction with the memory C40 Plus, a software tool for additional calibration functions is offered. Together with an individual cable harness it is possible to calibrate further sensors for chassis data logging. To connect memory C40 to the vehicle cable harness the special C40 adapter cable is necessary.

Conditions for use	
Operating temperature	-40 … 84°C
Humidity	5 % to 95 %, non condensing
Vibration	15 g peak to peak
Shock	max. 2,0 g

Order numbers	
24 MB flash card	**F 01E B01 101**
48 MB flash card	**F 01E B01 102**
96 MB flash card	**F 01E B01 103**
Memory adapter	**B 261 206 864**
Flash card adapter	**B 261 205 814**
SoftDrive	**B 261 208 858**
Software Chassis Adjust	**B 261 206 870**
C40 adapter cable	**B 261 209 433**

Laptrigger HF

This Laptrigger system consists of a high frequency transmitter station and a receiver which is installed in the car.

The system allows an exact laptime measurement. Sectiontime measurement for comparison of different car setups is also available if several transmitters are used.

Mechanical data	
HF-Receiver	
Size	60 x 98 x 24 mm
Weight	130 g
Patch antenna fixed to housing, antenna coated with foil for mechanical protection	
Dust and waterproof aluminium housing	
HF-Transmitter	
Size	200 x 77 x 45 mm
Weight	1300 g
Dust and waterproof PVC housing	

Conditions for use	
Working range	up to 150 m
Ambient temperature	-10 … 70°C
Power consumption HF-Receiver	2,0 W
Power consumption HF-Transmitter	3,5 W

Electronic data	
HF-Receiver	
32 kByte EPROM	
1 microcontroller	8 bit
Transmitting frequency	5,5 Ghz
Supply voltage	7,5 … 15 V
HF-Transmitter	
32 kByte EPROM	
1 microcontroller	8 bit
Transmitting frequency	5,5 Ghz
Supply voltage	7,5 … 15 V
Adjustable transmission power	max. 15 mW

Order numbers	
HF-Receiver	**B 261 209 856**
HF-Transmitter	**B 261 206 857**

Laptrigger IR

This laptrigger system consists of an infrared transmitter station and a receiver installed in the car. The system allows an exact laptime measurement. Section time measurement for comparison of different car setups is also available if several transmitters are used.

Mechanical data	
IR-Receiver	
Size	60 x 20 x 15 mm
Weight	30 g
Dust and waterproof aluminium housing	
IR-Transmitter	
Size	165 x 108 x 48 mm
Weight	690 g
Dust and waterproof aluminium housing	

Electronic data	
IR-Receiver	
Frequency codes	16
Supply voltage	8 … 16 V
Output voltage	5 V
IR-Transmitter	
Frequency codes	16+16 offset codes for section time
Supply voltage	8 … 16 V

Conditions for use	
Working range	15 m
Ambient temperature	-25 … 70°C
Same height between receiver and transmitter	
Visibility connection between receiver and transmitter	
Avoid direct exposure to sunlight	

Order numbers	
IR-Receiver	**B 261 206 875**
IR-Transmitter	**B 261 206 874**

Laptrigger IR-02

This laptrigger system consists of an infrared transmitter station and a receiver installed in the car. The system allows an exact laptime measurement. Section time measurement for comparison of different car setups is also available if several transmitters are used.

Notice: our old laptrigger IR is not compatible with IR-02. If both laptriggers are used at the same time, the transmitters have to be positioned with a minimum distance of 5 m.

Mechanical data	
IR-02-Receiver	
Size	42 x 20 x 10 mm
Weight	39 g
Dust and waterproof aluminium housing	
IR-02-Transmitter	
Size with diode	90 x 40 x 28 mm
Weight	124 g
Dust and waterproof aluminium housing	

Electronic data	
IR-02-Receiver	
Frequency codes	16
Supply voltage	8 … 16 V
Output voltage	5 V
IR-02-Transmitter	
Frequency codes	16 plus 16 offset codes for section times
Supply voltage	8 … 16 V

Conditions for use	
Working range	15 m
Ambient temperature	-25 … 70°C
Same height between receiver and transmitter	
Visibility connection between receiver and transmitter	
Avoid direct exposure to sunlight	

Order numbers	
IR-02-Receiver	
KPSE 6E8 3AP DN A34	**B 261 206 884**
AS-6-06-05PB-HE	**B 261 206 887**
KPTA 6E6-4P-C-DN	**B 261 206 888**
IR-02-Transmitter	**B 261 206 890**

Speed Box 2 Package

This box determines the speed signals of two wheels and passes the higher value on. This enables the logging of vehicle speed even with one wheel locked.

Mechanical data	
Size	40 x 40 x 38 mm
Weight	89 g
Environmental	IP65

Conditions for use	
Operating temperature	10 … 60°C

Connectors	
Input	2 x KPSE 120061-28
Output	1 x KPSE 6E8-3AP-DN

Electronic data	
Supply voltage	6 … 18 V
Supply current	4 mA

Order numbers	
Speed Box 2 incl. Cable harness	**B 261 208 281**
Speed Box 2	**B 261 208 284**
Cable harness	**B 261 208 285**

Speed Box 4

This box determines the speed signals of four wheels and converts them into a CAN-message. The message includes the time between each tooth-gap. The box is optimized for the MS 3-use.

Mechanical data	
Size	70 x 40 x 19 mm
Weight	90 g

Conditions for use	
Operating temperature	10 … 60°C

Connector	
	AS0-10-35PN

Electronic data	
Power supply	4 … 18 V
Current consumption	120 mA at 12 V
Channels	4 Speed
Channel input	1 … 150 V

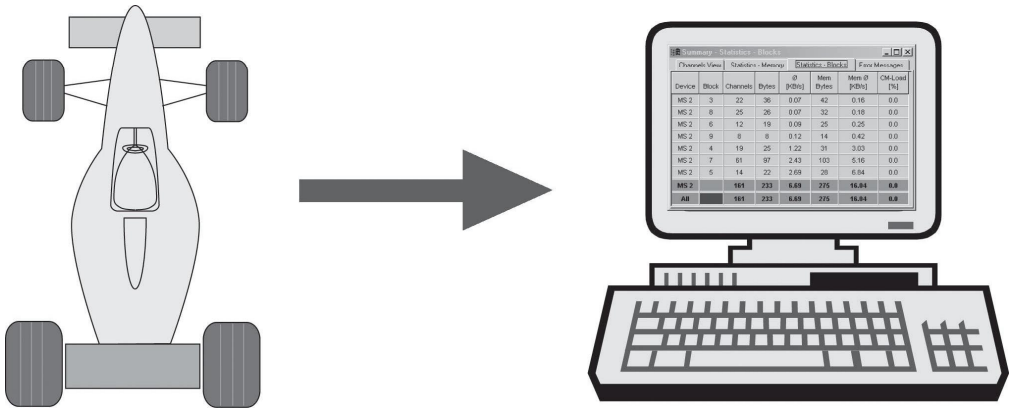
Order number	
Speed Box 4	**B 261 208 286**

Analysing

WinDarab

Data Recording, Analysing and Influencing

WinDarab is an evaluation tool for monitoring and analysing of logged data. It is Windows-based and specially designed for motorsport use. Depending on the functionality the software is available in two different versions, WinDarab-Light and WinDarab-Expert. For selection of monitored data channels and setting of sample rates the integrated configuration tool WinDCP is used.



Data evaluation
Auto load and auto store
Adjustable axis: time or distance
Direct read in of memory data without reader
Graphic display of all measured and stored channels
Various displays available (analogous and digital)
Number of displays available
Various display set-ups selectable and storable
Laptrigger signal included

Functions
Min/max-calculations
Histograms
Mathematical functions
Filter functions incl. FFT
x/y-plots

Data comparison
Calculation of differences lap by lap

Functionality
Creating of race tracks
Several segments adjustable for each race track
Lap reports and lap comparison
Inform displays
Data extract and export

Order numbers	
WinDarab-Light incl. Configuration tool WinDCP	**F 01E B01 402**
WinDarab-Expert incl. Configuration tool WinDCP	**F 01E B01 401**
Upgrade WinDarab-Light to WinDarab-Expert	**B 261 206 430**

Telemetry

Telemetry Unit FM4-Plus

The FM4-Plus is a real-time telemetry system used to get always actual data from the car out on the track. It fits most of the Bosch Motorsport management systems and is designed to transmit many various car and engine data due to its high speed data rate.

In typical applications data are sent from the car to the receiving station. With the optional software for bi-directional transmission, data can be sent in both directions.

Mechanical data	
Size	151 x 138 x 28 mm
Weight	720 g
Dust and waterproof housing with LED indicators	
Car antenna compatible to existing Bosch telemetry systems	

Conditions for use	
Vibration	6 g/20 Hz ... 2 kHz
Temperature range	0 ... 60°C
Max. power consumption	25 W at 14 V
International standard	I-ETS 300 220 ETS 300 113 FCC

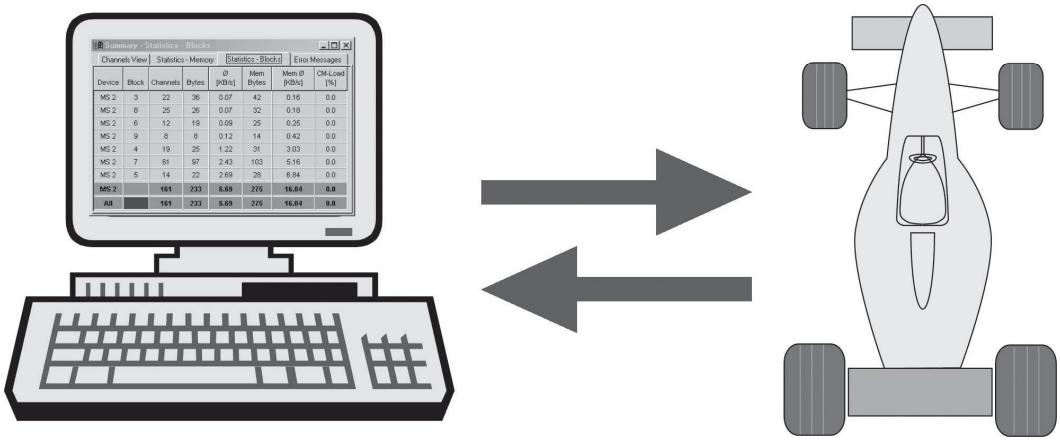
Electronic data	
Semi duplex radio modem (bidirectional)	
Internal data buffer and protocol management	
Transmission power	1 ... 10 W
Frequency range	430 ... 470 MHz (hardware adjustable)
Receiver sensitivity	-116 dBm error detection and forward error correction (FEC)
Data rate	max. 19200 bps
Required power supply	10 ... 18 V
Max. current	< 2,5 A

Connectors	
RF	BNC female
Power / data	CGK SOT 8N35 PN

Order number	
	B 261 208 885

Application

INCA-MSD



INCA is a software tool for measuring and calibrating defined engine parameters. According to different levels of functionality INCA is available in 2 different versions:

- The basic version INCA-Light is made for the quick use.
- The highly sophisticated version INCA-Expert is made for calibration and optimization.

Performance description
INCA-MSD is a combination of:
• **Project management:**
Visualization, processing and management of calibration, measurement and documentation data.
• **Programming system**:
Programming and management of program (code) and calibration data.
• **Measuring system**:
Acquisition, visualization, documentation and evaluation of measurement data.
• **Calibration system:**
Visualization and manipulation of parameters (calibration data).
• **Diagnosis system:**
Visualization, processing, documentation and evaluation of diagnosis data.

General functions
Online measurement and calibration
Basic configuration of a number of views
User-configurable menus of the diagnostic services and the displays on the screen
Easy switch between the configured views
Universal use for different ECUs
Controlled by mouse or menu, fast grip via keyboard and shortcuts
Data acquisition via central main window

Measurement system function

The measurements can be displayed in various ways: e.g. oscilloscopes, vertical or horizontal bar charts, numerical displays for numerical values or bit displays for binary values.

The oscilloscope allows you to have several scalar or binary measured signals displayed simultaneously.

Once measuring has been completed, you can complete the evaluation of the data either directly or in detail evaluation programs, such as the VS 100 program provides.

INCA processes characteristics and measured signals in the form of variables. These are structured alphabetically according to the DA-MOS/ASAP 2 definition, but are also available in an additional hierarchical display.

Using an editor, you define individual functions and so react in this way to different application tasks, such as the integration of different external data sources (thermo-scan, lambda display).

Free selection of measuring cells.

Calibration system function

INCA provides you with various editors for different characteristics, e.g. the tabular editor for processing curves and maps.

These curves and maps can be spread over several windows so that all values can be displayed at the same time.

To evaluate the data, use either the provided VSW program or copy the data to a spreadsheet program using the Windows buffer.

Free selection of calibration cells.

Functionality of potentiometer board: up to 12 pots with individually configuration.

Evaluation function

Calibration comparison function

A lot of auxiliary functions are supporting the user during the period of working in.

Required hardware components

PC:

IBM PC/AT compatible, 586 processor or higher, 166 MHz

Approx. 64 MB RAM

Approx. 30 MB harddisc space

VGA monitor

Operating systems:

Windows 98, 2000, NT and XP

Order number

INCA-Expert	**B 261 206 423**

KIC 2

(K-Line Interface Compact)

KIC 2 is part of the INCA module family. Within this family, the KIC 2 is the low cost unit for PC-supported application on the serial diagnosis interface of an ECU.

KIC 2 is coupled to the PC via the parallel printer interface. This ensures a powerful and universal link to all common PCs. The coupling to the ECU is effected via the K-line of the diagnosis interface. The functionality of KIC 2 is essentially determined by the operating programs of the PC.

Details
Compact design
Fully suitable for motor vehicle use
Power supply through the connection to the ECU from board mains with galvanic separation
All inputs and outputs to the PC galvanically separated
Firmware update possible via PC
According to ISO 9141-2 for diagnosis tester
Up to 250 kBaud transfer rate
Plug suitable for motor vehicles (VS 20)
Protocols: McMess, KP 2000, Keyword 71

Mechanical data	
Size	17 x 60 x 78 mm

Electronic data	
Input voltage	6 ... 30 V
Power consumption	typ. 1 W at 13,5 V
Power consumption in stand by	30 mW at 13,5 V
Processor	µP 87C520, 12 kByte
Flash Eprom	2 x 48 kByte
Centronics Iinterface	40 g/5Hz ... 2kHz
Temperature range	-30 ... 70°C
Control P-module output	
Output voltage	0 ... 4,096 V
Quantisation	ΔV=1,0 mV
Resolution	12 bit

Order numbers	
KIC 2, standard connector	**B 261 206 859**
KIC 2, diagnosis connector with ignition bridge	**B 261 206 866**
KIC 2, diagnosis connector without ignition bridge	**B 261 206 867**

Lambda Tester

This tester simulates the output signals of the lambda sensor in a quick and comfortable way. It allows you to check the function of the lambda control loop's hardware and software just before installing it into the vehicle.

Technical data	
Power supply	9 V
Output signals	40 / 800 / 900 mV
Internal resistance	10 / 50 / 100 Ω
Representable lambda values	0,65 …1,08

Function

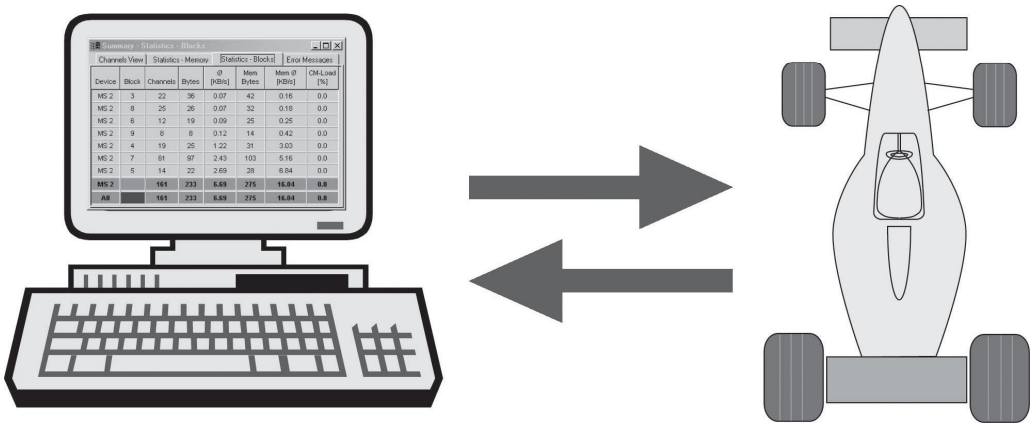
High precious simulation of various lambda values

Order number

B 261 206 879

Modas

Modas is a software tool for measuring and calibrating defined engine values and curves. It is specially designed for race track use. Developing Modas we set great store by easy handling and quick access to the ECU.



General functions
Online measurement and calibration
Universal use for different ECUs
Modas facilitates operating and working in by using the Windows standard. In the office Modas is controlled by mouse or menue. If Modas is used in a mobile way a fast grip is possible by keyboard and shortcuts.

Required hardware components:
PC:
IBM PC/AT compatible, 586 processor or higher, 166 MHz
Approx. 64 Mbyte of RAM
Approx. 30 Mbyte harddisc space
VGA monitor
Operating systems:
Windows 98, 2000, NT and XP

Performance description
Modas is a combination of
• **Project (Data) management:**
Visualisation, processing and management of calibration, measurement and documentation data
• **Programming system:**
Programming and management of calibration data
• **Calibration system:**
Visualisation and manipulation of parameters
(Calibration data)
• **Diagnosis system:**
Visualisation, processing, documentation and evaluation of diagnosis data

Order number
B 261 206 441

Potiboard POP
(Parameter Operating Panel)

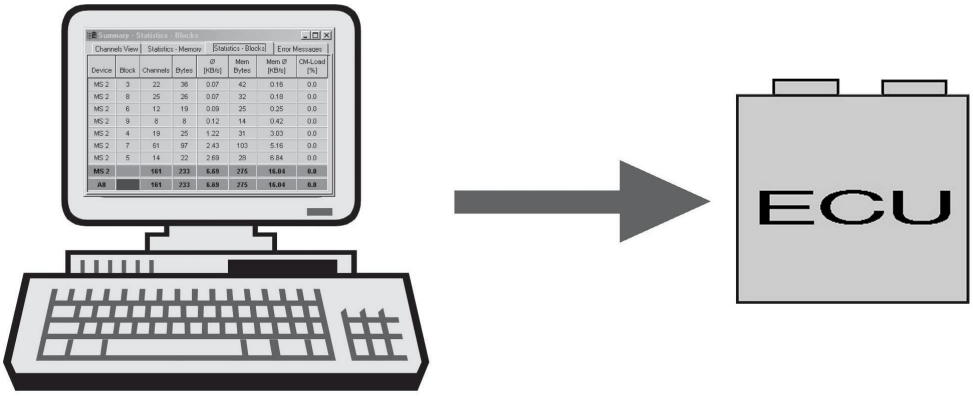
POP is part of the INCA module family. It is designed for online mapping on dyno supporting the INCA calibration function. POP is coupled to the PC via serial link on the SMB bus.

Details
Robust design
External power supply
Modification of calibration data by potentiometer operation
4 potentiometers, individual assignment to 4 characteristic values (fixed values, characteristic lines or maps)
Additive or multiplicative modification selectable
POP configuration saved together with the INCA display

Order number
B 261 206 428

ProF/Win

for Windows 98 , 2000, NT and XP



ProF/Win is used for programming the Flash EPROM of an ECU with the newest version of a program or data. This takes place via the diagnostic interface of the ECU using the K-line protocol, KWP2000 (physical addressing).

Functions
Programming new program versions and data records in an ECU application phase

Prerequisites
The following hardware components are required when using ProF/Win with ECU (MS 3.1):
PC
Pentium processor, SVGA 800 x 600 Frequence 266 MHz, 366 MHz recommended
Operating systems
Windows 98, 2000, NT and XP
Storage capacity
64 MB RAM, 128 MB RAM recommended, 40 MB on harddisc
Hardware interface
KIC, version 1.12 or higher
Latest version of the INCA devices recommended
Cable
PC to KIC

Hardware module KIC
Diagnostic interface:
ISO 9141-2 with K-line, max. 250 kBaud, adjustable via SW, galvanical separation
Diagnostic protocol:
KWP 2000 (with variations)

Order number
B 261 206 442

RS 2000

With RS 2000 you can simulate crank-shaft-, camshaft- and wheel-speed-signals quickly and comfortably.

Functions
Infinitely variable simulation of Hall- and inductive signal
Compatible with all Bosch-Motorsport-ECUs from MS 1.9 to MS 4.1
Adjustable on cylinder numbers from 4 to 12
Usable for increment- and segment-systems

Electronic data	
Power supply	12 V

Order numbers	
	B 261 206 862
Cable harness connector	**B 261 206 451**

Bosch Engineering GmbH
Motorsport
An der Bracke 9
71706 Markgröningen
Germany
Phone: 00 49 (0) 711/811-3981
Fax: 00 49 (0) 711/811-3982

North American Office:
Robert Bosch Corporation
Motorsport, Dep. AP/EAP
38000 Hills Tech Drive
Farmington Hills, MI 48331-3417
Phone: 00 1 248 848-2977
Fax: 00 1 248 324-7373

E-mail: motorsport@bosch.com
www.bosch-motorsport.com

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